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GENERAL VIEW

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GENERAL VIEW

OF THE

AGRICULTURE

OF

CHESHIRE;

WITH

OBSERVATIONS DRAWN UP FOR THE CONSIDERATION

OF

THE BOARD OF AGRICULTURE

AND INTERNAL IMPROVEMENT.

BY HENRY HOLLAND,

MEMBER OF THE ROYAL MEDICAL SOCIETY OF EDINBURGH.

> "Quand il est question d'estimer la puissance publique, le bel-esprit
> "visite les palais du prince, ses ports, ses troupes, ses arsenaux, ses
> "villes; le vrai politique parcourt les terres, et va dans la chau-
> "mière du laboureur. Le premier voit ce qu'on a fait, et le second
> "ce qu'on peut faire."
> ROUSSEAU.

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THE desire that has been generally expressed, to have the AGRICULTURAL SURVEYS of the KINGDOM reprinted, with the additional Communications which have been received since the ORIGINAL REPORTS were circulated, has induced the BOARD OF AGRICULTURE to come to a resolution to reprint such as appear on the whole fit for publication.

It is proper at the same time to add, that the Board does not consider itself responsible for every statement contained in the Reports thus reprinted, and that it will thankfully acknowledge any additional information which may still be communicated.

N. B. *Letters to the Board, may be addressed to Sir* JOHN SINCLAIR, *Bart. the President, No. 32, Sackville-Street, Piccadilly, London.*

PREFACE.

IN preparing for the public a detailed account of every object connected with the agricultural concerns and political economy of a large and opulent county, greater difficulties are met with than may generally be supposed. In a district of considerable extent, where numerous circumstances are occurring to vary the results of enquiry in individual cases, it is not easy to obtain correct information on subjects so various and multiplied. The reports of the most intelligent and observing are often contradictory. The views of some are too partial; of others, too extended; and attachments to favourite theories will sometimes warp the best judgments. Facts will be stated, without any detail of the circumstances accompanying them; and conclusions will be given, with a too general reference; though they may be the result of experiments, the success or failure of which have depended entirely on local peculiarity.

The Report of a County ought not to be the mere collection of a number of desultory and unconnected observations. To afford a clear and comprehensive view of the statistics or agriculture of any district, the selection, arrangement, and generalization of the information obtained, are essentially necessary; and unless this be accomplished, a work, however voluminous, will possess little real utility.

Impressed

Impressed by a sense of these and other difficulties, and feeling at the same time a distrust of my competency to such a task, I received the application which was made to me, to draw up a Report of the County of Chester, with a considerable degree of doubt as to the propriety of accepting the proposal. Urged, however, by the flattering solicitation of several friends, I was induced at length to undertake the work ; in the execution of which it has been my earnest desire to fulfil what appear to be the great leading objects of the Board of Agriculture, in promoting such an investigation. I fear the work will be found in many respects imperfect; but I can safely aver, that no exertions have been wanting on my part to render it as full and satisfactory as possible ; and that I have advanced nothing on any one subject, without making the most diligent and varied enquiries.

I might justly be accused of neglect or ingratitude, was I to omit mentioning the very liberal assistance which I have received from numerous quarters in the progress of the Report. My obligations to John Thomas Stanley, Esq. of Alderley Park, will be best seen by a reference to the several excellent communications with which this gentleman has favoured me. In addition to these, he has most liberally furnished me with much valuable information and assistance, on different subjects where his name does not appear. Equally am I indebted to George Wilbraham, Esq. of Delamere Lodge, and to George Leycester, Esq. of Toft, for the information which their superior knowledge of the agriculture and political economy of the county has afforded me; and for the very gratifying manner in which this information was communicated. From my worthy

thy and much respected relative, Mr. Holland of Sandlebridge, and from my father, I have derived many valuable contributions, and much general assistance in the progress of the Survey. I must, at the same time, acknowledge my obligations to many of the most respectable and intelligent farmers in the county, for the communications they have made on different subjects connected with the plan of the Report, and for the general interest which they have manifested in the promotion of the work. To Mr. Fenna, of Blackhurst, in particular, I am indebted for much useful information. From the Original Report of the County, by Mr. Wedge, I have likewise derived great assistance; and more especially in that part of the work which relates to the system of dairy management pursued in Cheshire.

It may perhaps be thought that I have entered into a more circumstantial detail of the Natural History and Manufacture of Salt in this County, than is consistent with the general plan proposed by the Board of Agriculture. I trust, however, that any objection of this nature will be entirely obviated, by a consideration of the importance of this manufacture in the political economy of the country; an importance derived as well from the fertile source of revenue which it affords, as from the extensive and rapidly increasing commerce to which its existence gives rise. I may remark, at the same time, that no very satisfactory account of the present state of the salt manufacture in Cheshire has hitherto been published; a circumstance which renders a collection of facts on this subject, a desideratum in the history of the British manufactures. These considerations, as well as the intrinsic interest connected with the subject, have induced me to enter upon it at greater length, than I should otherwise have conceived proper. Much, however, still remains for further investigation; and the advancing state of chemical and geological knowledge will probably lead to the elucidation of several points, which still remain involved in doubt and uncertainty. H. H.

Knutsford, October 27, 1806.

P.S. The desire, expressed by the Board of Agriculture, to procure some delineation of the soils in the severals districts surveyed, has induced me, subsequently to the completion of the Report, to attempt such a delineation on the general map of Cheshire. For the reasons, however, stated in the section on soil and surface, this sketch is necessarily extremely imperfect, and must be regarded as communicating only a very general view of the subject.

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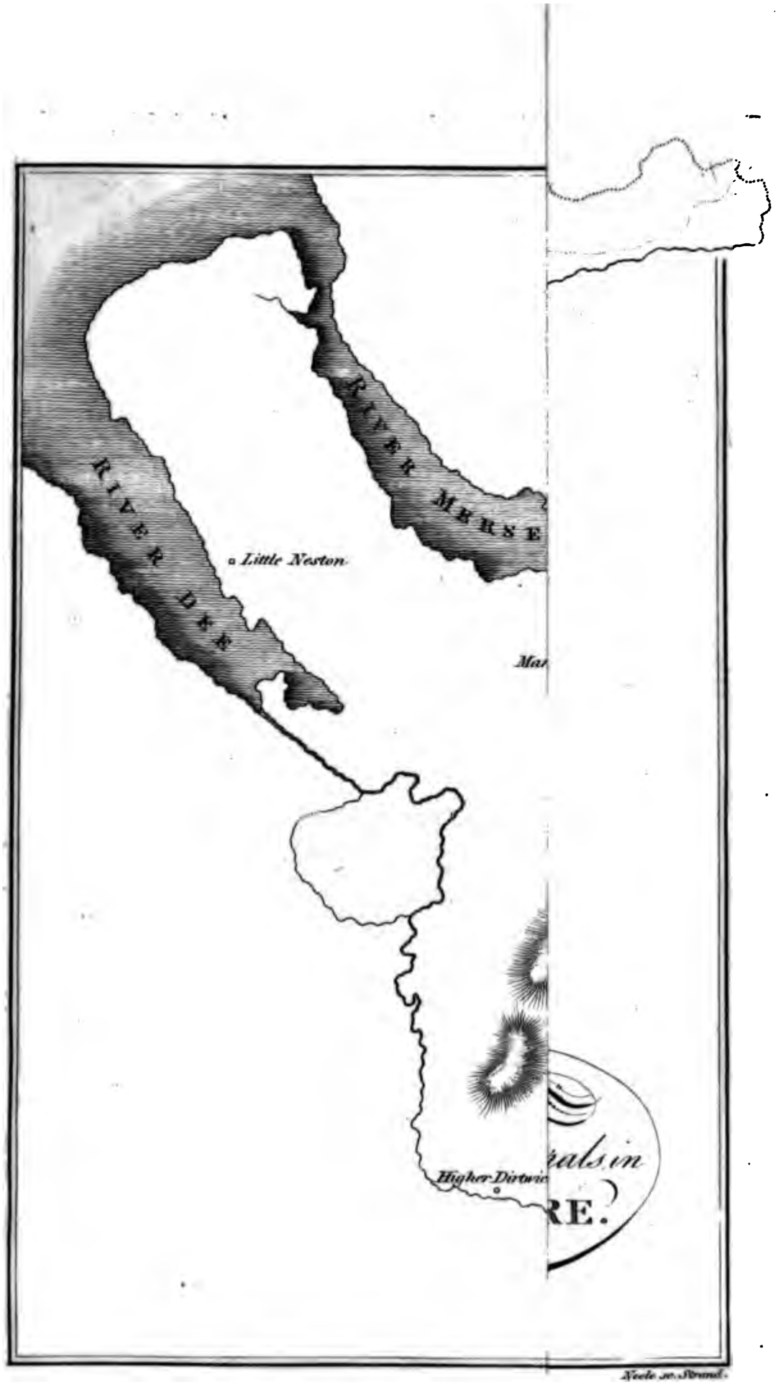

Neele sc. Strand.

AGRICULTURAL SURVEY

OF

CHESHIRE.

CHAP. I.

GEOGRAPHICAL STATE AND CIRCUMSTANCES.

SECT. I.—SITUATION AND EXTENT.

THE form of the county palatine * of Chester is peculiarly distinguished by the two long and narrow slips of land, which project to the east and west of its northern side; that on the east containing the principal part of the Stockport division of Macclesfield hundred; that on the west the hundred of Wirrall. Exclusive of these it is nearly oval, and is bounded on the north by

---

* The title *county palatine* originated in the peculiar jurisdiction enjoyed by the earls of Chester, termed *palatine jurisdiction.* The inhabitants of the county were tenants in chief to them alone, and they to the king. They had likewise the power of convoking their barons, tenants, and vassals to an assembly or inferior parliament; and all the courts of law within the county were held in their name. In the reign of Henry III. the succession of earls became extinct; and since that period the title of Earl of Chester has been invariably attached to the eldest son of the crown. The jurisdiction of the county is still peculiar; inasmuch as the assizes are never held by the judges of the king's courts of Westminster, but by two judges especially appointed, under whom the king has his own attorney-general.

Lancashire and a small point of Yorkshire; on the east by the counties of Derby and Stafford; on the south by Shropshire, and the detached portion of Flintshire; while its western boundary is formed by Denbighshire, Flintshire, and the estuary of the river Dee. The hundred of Wirrall is situated between the estuaries of the Dee and the Mersey, and is bounded at its north-western extremity by the Irish sea.

Cheshire, reckoning from the extremities of the county, lies between 53° 0′, and 53° 36′, *north lat.*; and 1° 46′, and 3° 22′ *w. long.* from London. Its greatest breadth, from north to south, is about 30 miles; the extreme length, from horn to horn, is 58 miles; but taken across the middle part of the county not quite 40. The circumference may be estimated at nearly 200 miles. It contains, as appears by a reference to Burdett's map, about 1040 square miles, or 665,600 acres, exclusive of the sands in the estuary of the river Dee, which may be reckoned at nearly 10,000 acres; a considerable part of these is now however secured by embankments from the sea, and still more may be, in process of time.

SECT. II.—DIVISIONS.

THE county of Chester is divided into seven hundreds; viz. Macclesfield, Bucklow, Northwich, Nantwich, Eddisbury, Broxton, and Wirrall. This is exclusive of the city of Chester, which is a county of itself, enjoying several peculiar privileges. The subdivisions are into parishes and townships. The former of these are usually much the most considerable in point of size; some parishes comprehending more than twenty townships.

ships. In a few instances, however, the limits of the parish and township are co-extensive.

The following is a list of the parishes in the county, distinguishing the hundreds in which they are respectively situated.*

Broxton hundred.

Aldford
Christleton
Coddington
Dodleston
Eccleston
Farndon
Guilden Sutton
Handley
Harthill
Malpas
Plemondstall
Pulford
Shochlach
Tattenhall
Tilston
Waverton.

Bucklow hundred.

Ashton upon Mersey
Bowden
Budworth magna
Grappenhall
Knutsford†
Lymme
Mobberley
Rostherne
Runcorn

Eddisbury hundred.

Barrow
Budworth parva
Bunbury
Frodsham
Ince
Over
Tarvin
Tarporley
Thornton
Weverham
Whitegate ‡

Macclesfield hundred.

Alderley

---

[*] I was favoured with this list by Mr. Nicholls, the deputy registrar of the county.

[†] Knutsford was formerly in Rostherne parish, but was made a distinct parish by an act of parliament, A. D. 1740.

[‡] Formerly in Over parish, but was made a distinct parish, by an act passed in the 33d year of the reign of Henry VIII.

Cheadle
Gawsworth
Mottram
Northenden
Prestbury
Stockport
Taxal
Wilmslow

Nantwich hundred.

Acton
Audlem
Baddiley
Barthomley
Coppenhall
Minshull
Nantwich
Wistaston
Wybunbury
Marbury chapelry, in this hundred, is in the parish of Whitchurch in the county of Salop.

Northwich hundred.

Astbury
Brereton
Davenham
Lawton
Middlewich
Sandbach
Swettenham
Warmingham

Wirrall hundred

Backford
Bebington
Bidston
Brombrough
Burton
Eastham
Heswall
Neston
Over-church
Shotwick
Stoak
Thurstaston
Wallazey
West-Kirkby
Woodchurch
Birkenhead, in this hundred, is an extra-parochial chapelry and township
Stanlow, township extra-parochial
Shotwick park, *ditto.*

In the city of Chester are nine parishes, viz.

St. Bridget
St. John Baptist
St. Martin
St. Mary
St. Michael
St. Olave
St. Oswald
St. Peter
Holy Trinity.

The precincts of the cathedral are extra-parochial. In the parishes of St. Mary, St. Oswald, and Holy Trinity, are included several townships, which are without the bounds of the city jurisdiction.

Cheshire contains one city, Chester, and twelve market towns, viz. Macclesfield, Stockport, Congleton, Sandbach, Middlewich, Nantwich, Northwich, Knutsford, Altringham, Frodsham, Tarporley, and Malpas.

SECT. III.—CLIMATE.

It is generally supposed that more rain falls in Cheshire than on the same surface of land in any other part of the kingdom, Westmoreland and the neighbouring county of Lancashire perhaps only excepted. Nor is it difficult to assign several probable causes of this fact. The contiguity of the county to the Irish sea; the general prevalence of westerly winds, bearing with them an atmosphere loaded with moisture from this sea, and the Atlantic Ocean; and perhaps also the relative situation of the Welsh hills, which by their attraction induce the clouds sooner to deposit their contents; are all circumstances contributing, in a greater or less degree, to the effect just stated. In itself it is highly beneficial to the general fertility of the county; the pastures of which, though naturally inferior to those of many other English counties, acquire, from the great quantity of rain falling on them, a superior richness of vegetation; and Cheshire may justly be reckoned one of the most productive grass-land districts in the kingdom; the grass retaining its verdure in the most sultry seasons, excepting in some places where it rests only on sand.

Owing to the relative situation of the county, and the general flatness of its surface, Cheshire enjoys, on the whole, a more mild and temperate climate than many counties situated under the same, or even a more southern latitude. In winter the frosts are not often severe, or of long duration; and the snow seldom continues on the ground more than a few days. The range of hills dividing the county from Derbyshire, which, from its situation and extent, may with propriety be denominated the English Appennines,* breaks the force of those easterly winds, which are so peculiarly prejudicial to vegetation on the opposite coasts of the island; while the prevalence of the westerly breezes, during a large proportion of the year, produces an equality of temperature favourable both to the agriculture of the county, and to the general salubrity of the climate.

SECT. IV.—SOIL AND SURFACE.

General Surface.—THE general appearance of Cheshire is that of an extended plain, thickly covered with wood; so that from some points of view the whole country resembles one vast and continued forest. The most elevated part of the county is on the eastern border, where a chain of barren hills, connected with the mountainous ridge that divides Cheshire from Derbyshire, extends from Lawton, on the borders of Staffordshire, to the north-eastern extremity of the county, a distance of about 30 miles. From Macclesfield, in a north-westerly direction, the surface is irregular and hilly; but this continues only as far as Alderley, five or six miles from Macclesfield. Here we find a singular hill called Alderley Edge, rising gradually from the S.S.E., and falling down abruptly towards the north. On the western side of the county, a broken and irregular range of hills presents itself, originating near Malpas, running northwards across Delamere forest, and terminating, by a bold promontory, not far from Frodsham. The length of this ridge, which however meets with several interruptions, is more than twenty miles. The most singular feature in it, is the insulated rock of Beeston, situated about two miles to the south of Tarporley; which forms a most striking object from the whole of the surrounding country, and even from the neighbourhood of Liverpool. This rock, which on one side rises almost perpendicularly to the height of 366 feet, is composed of sandstone. Its summit is crowned with the ruins of Beeston castle, a fortress erected A.D. 1220, and formerly esteemed impregnable.

---

* This mountainous ridge extends from the borders of Scotland into the middle of England, forming in its course a natural division between the eastern and western parts of the island. Its length may be estimated at 160 miles.

The remaining part of Cheshire, amounting to nearly four-fifths of the county, is remarkable for a general flatness of surface, being probably not more on the medium than from one to two hundred feet above the level of the sea. Small eminences and swelling banks, separated by valleys, are however to be met with in almost every part of the county; a natural consequence of the numerous rivulets and streams, which, originating in the hills, find their way into the Weaver, Mersey, and Dee. These, in some measure, relieve the otherwise unanimated flatness of the surface.

Soil.—It was my original intention to have procured for this report, an accurate map of the soils in Cheshire;

and, with this view, I sent several sketches to different parts of the county, to be filled up by delineations of the soil in each particular district. I was under the necessity, however, of relinquishing this design, in consequence of the very great intermixture of soils in the county, which rendered it difficult, if not impossible, to obtain information sufficiently correct for their delineation in a map. For this reason, it will not be in my power to give so clear and precise a view of the subject, as I could have wished; but I may remark at the same time, that the circumstance which makes it a matter of so much difficulty to procure an accurate representation of the soils, would have the effect of rendering such a representation, if procured, less valuable and interesting than it would be, were they more distinctly marked out by nature.

Clay and sand form the most predominant features in the prevailing soils of Cheshire; and of these a tolerably strong retentive clay exists in the largest proportion. Generally speaking, however, these two earths are so blended together throughout the county, that it is only in particular districts, where an observer would at once pronounce the soil to be clay or sand; though soil, strictly speaking, should never be called either the one or the other. On this account the terms *clayey loam* or *sandy loam*, according as clay or sand predominates, are the most accurately descriptive of the general nature of the Cheshire soils. There is a great extent of black moor or peat-moss land, in different parts of the county; but a considerable portion of this has been of late years enclosed.

The substrata are of various kinds, clay, marl, sand, rammel, foxbench, gravel, or red rock; but most commonly one of the two former, viz. clay or marl. The term *rammel*, or *rammelly soil*, is usually applied in this county to a composition of various kinds of clay, white sand, and gravel, intimately mixed with a small proportion of oxide of iron. It is generally met with under a weak brown, or grey soil, which seldom exceeds four or five inches in depth. It lies in strata, from eighteen to thirty inches in thickness, upon white or red sand, or clay marl; the latter frequently partaking of its nature for the depth of a few feet. Rammel is penetrable by the roots of trees, but is notwithstanding very unfavourable to the vegetation of the places where it is met with. Still more injurious in its effects on vegetation is the substance called *foxbench*. This is very frequently met with in Cheshire, lying in beds from six inches to three or four feet in thickness; and, like rammel, is usually covered with a thin weak soil. It is, in fact, an iron ore, formed by the deposition of oxide of iron, in the filtration of ochry water through a bed of sand, which by this means has become concreted into a hard rocky mass, crumbling to pieces however on exposure to the air. This substance effectually prevents roots from striking into it; and, of course, is extremely unfavourable to the progress of vegetation. How far the generally prevailing opinion, that it robs manure of its fertilizing qualities, may be regarded as accurate, I have not had the opportunity of ascertaining: at all events, foxbench is one of the greatest enemies the farmer has to contend with, in the management of his land. He has no better remedy against its bad effects than digging through, and throwing it on the surface, where it will soon be decomposed by the atmosphere. The origin of the name *foxbench*, is doubtful. It may perhaps be derived from the colour of the substance, which somewhat resembles that of a fox; more probably however from its forming shelves or benches in the midst of sand strata, on the sides of banks and sandholes, where foxes are often found to harbour.

From the intermixed state of the clay and sand districts in Cheshire, it is, as I observed before, extremely difficult, if not impossible, to ascertain their respective limits with any degree of exactness. Perhaps the following statement, which I believe to be accurate, will convey some general idea of the nature of the soil in the several hundreds.

Macclesfield hundred.—In the northern part of this hundred there is a very considerable district of clay, or clayey loam, comprising Wilmslow, Cheadle, Bramhall, Woodford, Dean-Row, &c. At the extremity of the eastern horn of the county, we meet with a tract of peat-moss land, called Featherbed-moss, connected with the Yorkshire and Derbyshire hills. The middle and southern parts of this hundred are chiefly sand, or sandy loam, with a considerable quantity of heath and peat-moss land on the high grounds which separate the county from Derbyshire.

Bucklow hundred.—In this hundred, the soils are very much intermixed; clay and sand, in different proportions, being met with in almost every township. On the eastern side there is a considerable tract of sandy loam, connected with that in Macclesfield hundred, comprehending Knutsford, Bowden, Altringham, Warburton, &c. About Whitley there is a district of stiff clay land. Small tracts of peat moss are to be met with in different parts of the hundred.

Northwich hundred.—In this hundred the proportion of clay and sand is nearly equal. The sand is connected with that in Macclesfield, and Bucklow hundreds, comprising nearly the whole of the district which would be formed by a line drawn westwards from Congleton to

Sandbach, and thence to the north through Swettenham, Twemlow, and Goostrey. In this district is comprehended the extensive waste of Rud-heath. The remaining part of the hundred is principally either a strong clay, or clayey loam.

Nantwich hundred.—Here too the soils are various, but there is upon the whole a very considerable preponderance of clay. About Crewe, Church-Coppenhall, Church-Minshull, and Leighton, we meet with a strong retentive clay, upon marl. In the southern part of the hundred there is a small tract of sandy loam, stretching from Wybunbury to Audlem; and similar ones are met with in the immediate neighbourhood of many of the villages.

Eddisbury hundred.—The extensive waste of Delamere forest situated in this hundred, is almost entirely a gravel or white sand, interspersed with tracts of peat-moss. At the mouth of the Weaver there is a large extent of marshy land called Frodsham Marsh. To the south of Delamere forest, we meet with some clay near Wettenhall, Calvely, &c ; but upon the whole there is a considerable predominance of sand in this hundred.

Broxton hundred.—A strong retentive clay prevails throughout the greater part of this district. Malpas, in the southern part of the hundred, stands upon a freestone rock, covered with a deep and good soil. On the banks of the Dee there is a considerable quantity of meadow land.

Wirrall hundred.—In this hundred also, clay very greatly predominates. Some sandy land is met with at Wallazey, and West Kirkby, and near the estuary of the Dee. The soil is, generally speaking, very thin, with a substratum of rammel or marl, usually the former.

The proportions of the cultivated parts of Cheshire, and those which lie either waste or in a state of little profit, are perhaps nearly as follow:

	Acres.
Arable, meadow, and pasture land, including parks, and pleasure grounds,	620,000
Waste lands, heaths, commons, and woods,	28,600
Peat-bogs, and mosses, -	18,000
Sea-sands, within the estuaries of the Dee, and Mersey, nearly - -	10,000
	676,600

SECT. V.—MINERALS.

UNDER this head the objects most worthy of attention are undoubtedly the beds of fossil salt, and of coal, met with in different parts of Cheshire. From its peculiar importance to the political economy of this county, and for other reasons mentioned in the preface, I have been induced to enter at greater length upon the natural history and manufacture of salt, than might at first appear consistent with the general plan of a report of this kind. The interesting nature of the subject will however, I trust, be a sufficient excuse, independently of any other consideration. With the exception of the copper and lead ores worked at Alderley Edge, and its neighbourhood, no other minerals in the county seem particularly to merit attention.*

Coal.—This valuable mineral is worked to a very considerable extent in Cheshire, in the district of country between Macclesfield and Stockport, and in the township of Little Neston in the hundred of Wirrall. At the latter place, the seam of coal is, I understand, five or six feet in thickness; and the workings are carried to a considerable distance under the channel of the Dee. No coal has been met with in the range of hills which runs through the middle of Cheshire, nor in any of the flat part of the county. It was remarked, however, by the late ingenious Mr. Whitehurst, that "the sand-beds in Cheshire are frequently accompanied with a very curious phenomenon. At Mere, near the seat of Peter Brooke, Esq., I saw a sand-pit containing the fragments of pit-coal, and cinders deposited in a stratified manner through a considerable extent of the bank.* I have also observed the same appearances at Mobberley, near Knutsford. The above fragments of coal and cinders lay six or seven feet below the surface of the earth; and I have lately been informed, by a gentleman of that neighbourhood, that such appearances are not peculiar to the sand-beds of Mere, and Mobberley, but that they are almost universal, wherever sand-pits are dug in Cheshire."†

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* The places referred to in the account of the minerals of Cheshire will be found by a reference to the map prefixed to this section.

This stratified appearance of a carbonaceous substance, in many places of the thickness of six or eight inches, may frequently be observed, especially in beds of sand, as described by Whitehurst. In boring, however, a few years ago, to the depth of sixty yards, in the lands of Lawrence Wright, Esq. in Mobberley, no coal was discovered. A considerable quantity of gypsum was found at different depths, mixed with the strata of earth which were passed through; and it seems probable, that either rock salt, or brine, rather than coal, would have been met with, had the boring been continued to a greater depth.

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* The small fragments, and thin layers of coal, which are often found in beds of sand and other strata in Cheshire, have evidently been brought from a distance, and deposited by the same floods or torrents which have deposited the sand. The quantity is too insignificant to be worthy of any attention, otherwise than as the smallest quantity of any substance must prove that a portion of the same substance has had an existence in the place from which it had been originally conveyed. So many changes have taken place on the surface of the country over which the water depositing the strata of Cheshire has flowed, that it would be now impossible to ascertain where the substances forming these strata were detached from their primary positions. J. T. S.

† Whitehurst's inquiry into the original state and formation of the earth. p. 16.

The range of high ground running between Macclesfield and Stockport, and connecting itself with the Derbyshire hills, is the principal source of the coal worked in this county. Collieries are established in the townships of Hurdsfield, Rainow, Bollington, Adlington, Pott-Shrigley, Lyme, Worth, Poynton, and Norbury; including a district, from south to north, of about ten miles. In all these townships, the principal seam of coal is found nearly at the same level, from 70 to 100 yards below the surface. Various strata are passed through in getting down to it, among which are several other beds of coal, but not of sufficient thickness, or quality to bear the expences of working. The seam of coal that is worked is usually met with under a stratum of sandstone. It varies very considerably in thickness; but generally speaking, a gradual increase in this respect is found to take place, as it is traced towards the north. In the immediate neighbourhood of Macclesfield, it is so thin as scarcely to repay the expences of working. Through Hurdsfield, Rainow, Bollington, Adlington, and Pott-Shrigley, the thickness of the bed increases from one to two feet. From Lyme, through Worth, Poynton, and Norbury, it swells into ten feet. The quality of the coal is very various in different parts of the district, but is, generally speaking, exceedingly good.

There is no peculiarity worthy of notice in the mode of working these mines. The water is in most instances raised from the pits by the aid of the steam engine; in Pott-Shrigley, however, there is a considerable colliery, where it is drained from the bottom of the works, which are at the depth of one hundred yards from the surface, by a tunnel cut under the hill for that purpose. Through this tunnel the water is conveyed into a brook, running in a deep valley, at a distance of nearly a mile from the works.

The town of Macclesfield, and the middle and southern parts of the hundred, are principally supplied with coals from the collieries in the first five of the townships, which have been named. The largest colliery in any of these townships is that now working at Pott-Shrigley; the coals from which are esteemed of a very superior quality. Stockport, and its populous neighbourhood, derive their supply of fuel from the collieries in the townships more nearly adjacent. Those at Worth and Poynton, are much the most considerable, affording an inexhaustible supply of excellent coal, which is worked with much spirit, and to great profit. The prices at the different collieries vary, of course, according to the quality of the article; and as no coals in this neighbourhood are sold by weight, it becomes difficult to ascertain the relative proportion which the prices at the several pits bear to each other, and to those in other coal districts.*

Copper, lead, and freestone at Alderley Edge, &c.—In speaking of the general surface of Cheshire, I mentioned this hill as forming a striking feature on the eastern side of the county, rising gradually from the south-east, and terminating abruptly towards the north, by a precipice of three or four hundred feet in height. A sand-stone rock breaks out in many places on the summit, and northern side of the hill, having an inclination from south-west to north-east, at an angle of 14 degrees with the horizon. Some of the strata of this stone are three or four yards in thickness, and are separated from those above and below by thin seams of marl, here and there tinged with a slight colouring of copper. The stone is in great repute for building. Lumps of marl are, however, sometimes met with, even in the most solid blocks; and still more frequently the rock abounds with pebbles of quartz, bedded in it in all directions. There appear to be three or four great breaks, or interruptions of the sandstone strata, in the structure of the hill. These extend across it, from west to east, and are filled irregularly with sand-stone, and masses of sulphate of barytes; amongst which are many veins of lead and copper; in some places distinct from each other, in others so mixed, as to render it somewhat difficult to ascertain, from mere observation, which of the two metals predominates. Some specimens of very rich lead ore have been obtained; but on the whole it is poor, and is, as well as the copper, intimately mixed with the grit or sand-stone. Some ore of cobalt has also been met with. The veins of all these metals approach very near to the surface, and have been found to ramify, with increasing richness, to a depth of thirty or forty yards. In all probability, they extend much further into the body of the hill.

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* For the information with respect to the collieries in Macclesfield hundred, I am indebted to Edward Downes, Esq. of Shrigley Hall.

About a century ago, Mr. Abbadine, a Shropshire gentleman, cut a tunnel, one yard wide and five feet in height, half through the hill, at the depth of about thirty yards from the highest surface. He met with nothing but the sand-stone, until he arrived at the centre; and finding there that the valuable part of the ore was considerably below the level of his tunnel, he abandoned the enterprise. Since that time different companies have engaged in the same speculation, and have driven tunnels, and sunk shafts into various parts of the hill; but without finding an ore sufficiently pure to render the mine valuable. The last company who undertook it was that of which Mr. Rowe, of Macclesfield, was at the head. This gentleman was at one time very sanguine in his expectations of success, and kept not less than forty or fifty men constantly employed; but upon the discovery of the great body of copper ore at the Parys mine, in which he was engaged, he suddenly gave up his concern at Alderley-Edge, and took all his miners with him into Wales.

After this time, no search for copper or lead was made in the hill, until two or three years ago; when, upon the unexpected discovery of a few veins of good ore at the extremity of the old works, some gentlemen of Stockport were induced to recommence the speculation. Their prospect of success appears, at present, good; large quantities both of copper and lead ore have been obtained, and they are now engaged in the erection of works for preparing and smelting it.

At Mottram St. Andrew, a mile or two to the north-east of Alderley-Edge, in the lands of Lawrence Wright, Esq. both lead and copper ore have been met with. Intermixed with the sandstone, which is the matrix of these ores, some cobalt ore has been lately found; but at present, the quantity is not sufficient to render it an object worthy of attention.

Alderley-Edge, and its neighbourhood, are not the only places in Cheshire where copper ore has been met with. It has been long known to exist in the Peckferton hills, which form the southern part of the tract of high ground running across the middle of the county. Here it has been worked irregularly at different times; but from the small quantity obtained, and its inferior quality, the speculation was not attended with profit to the proprietors. I understand, however, that a vein has lately been met with in these hills, on the estate of John Egerton, Esq. of Oulton, from which there is every prospect of obtaining a considerable quantity of valuable copper ore.

Several quarries of excellent freestone are worked in different parts of Cheshire, among which those at Runcorn, and at Manley on the north-west side of Delamere forest, are the most considerable. From these quarries stone has been obtained for the erection of many of the modern houses of proprietors in the county: the splendid edifice of Lord Grosvenor, at Eaton, has been constructed entirely of stone from the quarry at Manley. At Kerredge, on the hills near Macclesfield, a species of sandstone is met with, peculiarly adapted to the making of flags, or whetting tools. Kirwan, in his Elements of Mineralogy, Vol. I. p. 142, particularly mentions this stone, describing it as a siliceous grit with an argillaceous cement. He states its specific gravity at 2.544. Previously to the introduction of the Welsh slates, it was used to a considerable extent in this county, for the purpose of roofing houses and other buildings: its application in this way is now however much more confined.

In Styperson park, near Pott-Shrigley, a fine compact sandstone is met with, admitting of a good polish. The quarry, however, has not been worked for the last eight or ten years; as from the extreme hardness of the stone, the expence of getting it is very considerable. Several other quarries of excellent freestone are worked in this neighbourhood.

Limestone is found no where in Cheshire, excepting at Newbold-Astbury, about three miles to the south of Congleton, where large quantities of it are burnt upon the spot; the coals for this purpose being brought from the collieries in the adjacent part of Staffordshire. This limestone is heavier than that in the neighbourhood of Buxton; and when burnt has more of a grey colour. It is now very much used as a manure, many farmers preferring it to Buxton lime. It is longer in breaking down, but swells more, and is thought to be more durable in effect.

Rock and White Salt.—There are few objects more interesting in the natural history of this island, than the rich brine springs, and extensive beds of fossil salt found in the county of Chester; and there are none more important in its political economy, whether we consider the manufactures and commerce to which they give rise, or the fertile source of revenue which they afford to the country.

The principal *Brine Springs* in Cheshire are found in the valleys through which the Weaver, and the little rivulet the Wheelock have their course; and generally near the banks of these streams.* If we except a spring of weak brine at Dunham, near the Bollin; and the springs at Dirtwich, in the most southern part of the county, no others have ever been worked. By their means an importance is given to the Weaver, which it would not otherwise possess; and there is probably a greater bulk of carriage on this stream, than on any other river in the island, of itself so little considerable.

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* See the subsequent section on *water*.

Tracing the Weaver from its source, at the Peckferton hills, we do not find any springs strongly impregnated with salt near it, till it approaches Namptwich. That brine does exist as high up as Bickley, though it has not been ascertained at what depth, or of what strength, appears probable from a sinking of ground, and consequent filling of the cavity with brine, which took place in this neighbourhood in 1657; a relation of which is given by Dr. Jackson in the Philosophical Transactions,* and a still more particular account by Childrey.† Leland gives the history of a very similar occurrence at an earlier period, a few miles south of this. He relates that, "about a mile from Combermere abbey, part of a hill with trees upon it, suddenly sunk down, and was covered with salt water, of which the abbot being informed caused it to be wrought; but the proprietors of the wiches compounding with him, he left off working." He adds, "that this salt pool still continued in his time, but that no care was taken of it."‡

A few miles lower down the Weaver than Bickley, in Baddiley, and one or two adjoining townships, springs are met with impregnated with salt in various degrees. Brinefield, is the name given to several of the inclosures in Baddiley. When the river takes a northerly direction at Audlem, brine is met with on each side of it, and may be found, on sinking near its banks, all the way from thence to Namptwich. About midway between Audlem and Nantwich, there is a farm, which retains the name of Brinepits farm, where salt was formerly manufactured. A little further down, brine was found, and salt made, on each side of the river, at Austaston, and Baddington.* At the present time, however, none is manufactured till we get to Nantwich, where numerous brine springs are met with. Continuing our course down the river, we find brine at Winsford. Betwixt Winsford and Northwich, attempts have been made to get down to it; but these have hitherto been rendered unsuccessful by the quantity of fresh water which has been met with. It is again found at Leftwich, in the angle betwixt the Dane and the Weaver; at Northwich; at Witton, half a mile north of Northwich, on a small brook of the same name, which falls into the Weaver at Anderton; and at Anderton, a township about a mile below Northwich. At Barnton, a mile still lower down the river, a weaker brine has been found; and again at Saltersford, about a mile below Barnton. Two miles still lower, in Weverham, brine has been found, and was worked as early as the time of William the Conqueror. It does not appear that any has been discovered below this place.

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* Lowthorp's Abridgment of the Philosophical Transactions, Vol. II. page 352.

† Childrey's Britannia Baconica, page 182.

‡ Leland's Itinerary, Vol. I. p. 82.

Following the course of the little stream, the Wheelock, we first meet with brine at Lawton, on the very confines of the county; then three or four miles lower at Roughwood, in the township of Bechton; again at Wheelock; and, lastly, at Middlewich, where the Wheelock falls into the Dane.

No brine has been found in the valley through which the Dane flows from Middlewich to Northwich. Higher up this stream, in the neighbourhood of Congleton, some of the enclosures have the name of Brine-field, Brine-hill, &c.; whence we may conclude, that brine has some time or other been discovered there.

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* King's Vale royal, p. 66.

Though the places which have been mentioned are the only ones where brine has been found, and works for its evaporation erected, there is little doubt but it might be met with in almost every part of the valleys through which the Weaver and Wheelock take their course, did not the fresh water springs prevent the access to it.

The *Depth from the Surface* at which the brine springs are found; the level they take when the stratum which immediately confines them is penetrated; and the abundance of the springs, are very various. At Nantwich, the brine is met with about ten or twelve yards from the surface; and in sinking for fresh water it is necessary to do this with caution, that the brine may be avoided. In sinking for the foundation of a bridge, a few years ago, just above this town, a very copious brine spring was found about eight yards from the surface; and the workmen were much incommoded by it. The brine springs rise nearly to the surface. When we get to Winsford, to which place the Weaver is made navigable, we find the brine at a much greater distance from the surface; and it is generally necessary to sink from 55 to 60 yards before it is met with, when it is found in great abundance. It has its level 12 yards from the surface. At Northwich, it is found at a depth from 30 to 40 yards, the springs being very fluent; its level is about 20 yards from the surface. At Witton, it is met with about the same depth, and rises to the same level, the springs being equally copious. Through the whole of Anderton, the quantity of brine is most abundant; at the higher end of this township, it is found about 40 yards from the surface, and the level is nearly the same as that at Witton. Somewhat lower down, it is necessary to sink from 50 to 55 yards before it is met with. Still keeping the course of the river, at Barnton, about a mile below Anderton, on sinking 65 yards, and boring 50 yards below this, a very weak brine was discovered, and that in small quantity.

If we trace the different brine springs along the little stream the Wheelock, we find that at Lawton they are met with about 85 yards from the surface, and have their level at 70 yards. The springs are much less copious than many of those on the Weaver. At Roughwood, the brine is 50 yards from the surface, and rises 15 yards; the spring is by no means abundant, and is often pumped dry. At Wheelock it is found at the depth of 70 yards, and rises within 30 yards of the surface; the springs being very copious. At Middlewich, the brine is at different depths, from 35 to 84 yards; in one pit, in which it is found at 70 yards deep, it rises to the surface. The springs here are by no means fluent, and are occasionally pumped dry.

Of the *Discovery of the Brine Springs*, and the time when they were first worked, we have no certain accounts. There can be little doubt, but that at a very early period, salt must have been procured from the brine springs which found their way to the surface. This, as has been mentioned, is particularly the case with the springs in the neighbourhood of Nantwich and Middlewich; and we learn from Doomsday book that, at the time of Edward the Confessor, brine-pits were wrought at all the wiches in Cheshire. It seems however that, even several centuries afterwards, the art of making salt was very imperfectly understood in any part of England; and that the quantity manufactured was very inconsiderable. Henry VI., being informed that a new method of making salt had been invented in the Low Countries, by which it might be made more abundantly in England than it had hitherto been, invited John de Sheidame, a gentleman of Zealand, with sixty persons in his company, to come into England, to instruct his subjects in the new method of making salt, promising them protection and encouragement.* Whether they came, or what their improvements were, does not appear; but it is probable that these were not of much importance, or that they were lost; for we find the Royal Society, soon after its institution, very intent upon improving the art of manufacturing white salt, and publishing, towards the close of the 17th century, the histories of several modes of making it; particularly Dr. William Jackson's account of the brine springs, and the mode of making white salt at Nantwich, in Cheshire; and Dr. Thomas Rastel's account of the manufacture of it at Droitwich, in Worcestershire. These are rather reports of the methods of manufacture then used, than suggestions of improvements. The salt made in England was still considered inferior to that made abroad; and what was manufactured in Cheshire was confined to the supply of its own consumption, and that of a few neighbouring counties.

The want of knowledge in the manufacture, and the supposed superiority of foreign over English salt, attracted in the beginning of the last century, the attention of the House of Commons; and Mr. Lowndes, a Cheshire gentleman, received a reward from parliament, in consideration of his making known some improvements he was imagined to have made in the manufacture of salt. Soon afterwards the late Dr. Brownrigg published his ingenious and philosophical work on "the art of making common salt;" in which, in addition to a full and detailed account of the processes in the manufacture of it, at that time used, he suggested a variety of alterations and improvements. Some of these were adopted, though not to the extent which was admitted of by the state of the manufacture. In consequence however of these and various subsequent improvements; joined to the increased commercial spirit of the country; and the facility of communication with Liverpool, which was added to by rendering the Weaver navigable for vessels of considerable burthen from Northwich and Winsford; the manufacture of white salt in Cheshire, as well for home consumption, as for exportation, has exceedingly increased in the course of the last century, more particularly towards the close of it; and the support of it is now become an object of the first consequence, not only to the county itself, but to the nation at large.

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* Rymeri Fœdera, Vol. x. p. 761.

Though the brine springs appear to have been known and worked in the earliest periods of the history of this country, the *Discovery of the beds of Fossil or Rock Salt* is of much more recent date. The first of these was found in the year 1670, about 34 yards from the surface, in searching for coal in Marbury, about a mile north of Northwich. The bed of it which was met with was 30 yards in thickness; and underneath it was a stratum of indurated clay. The discovery of this bed of rock salt in Marbury, led to other attempts to find it; and on sinking a shaft any where within half a mile of the place where it was first found, it was met with, about the same distance from the surface, if the access to it was not prevented by brine or fresh water.

This continued to be the only part of the county in which rock salt was found, till the year 1779; when in searching for brine, near Lawton, it was there met with, about 42 yards from the surface. The stratum of it was only four feet in thickness. Beneath this was a bed of indurated clay, ten yards thick; on penetrating which, a second stratum of rock salt, 12 feet in thickness, was found. On continuing the sinking, another stratum of indurated clay, 15 yards thick, was passed through; and underneath this appeared a third stratum of rock salt; which was sunk into 24 yards. The lowest 14 yards being the purest, these only were worked.

Hitherto no attempts had been made to find a lower stratum of rock salt in the neighbourhood of Northwich; for as the one first met with was so thick, and furnished such abundant supply for every demand, there could be no other inducement to this than the hopes of meeting with a stratum, at greater depth, containing a smaller admixture of earth. It appears too that the fear of meeting with springs below, which might impede the working of the pits, or even render this entirely impracticable, prevented the owners of them from sinking deeper.* As however no inconvenience of this kind had occurred, on sinking through several alternate strata of rock salt and clay at Lawton; and it had been found that there was a lower stratum of rock salt there, more pure than those nearer the surface; the proprietors of one of the mines near Northwich were led, in 1781, to sink deeper than had yet been done, and to pass through the bed of indurated clay, lying underneath the rock salt which had been so long known and worked. This indurated substance was found to be from 10 to 11 yards in thickness; and immediately beneath it a second stratum of rock salt was met with, the upper portion of which differed little in purity from the higher stratum; but on penetrating into it from 20 to 25 yards, it was there found much more pure and free from earthy admixture. It continued to have this increased degree of purity for four or five yards only; and for 14 yards still lower, to which depth the shaft was sunk, the proportion of earth was again as large as in the upper part of the stratum. It was therefore thought useless to sink further.

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* Dans la crainte de rencontrer des sources d'eau; qui generoient, ou peut-être detruiroient l'exploitation, on n'a pas approfondi dans la masse de sel au dessous de 10 toises.

Jar's Voyages Metallurgiques. Tome 3, p. 24.

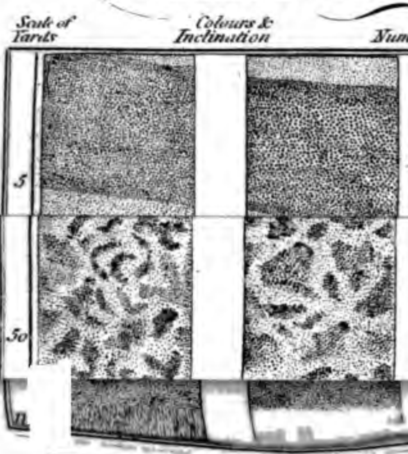
Several other proprietors of mines in the neighbourhood followed the example which had been set them; and penetrated through the bed of indurated clay lying beneath the upper stratum of rock salt. A second stratum of rock salt was always met with below this; and on passing down into it, the same order of disposition as to purity was met with, as in the mine in which it had been first examined; and the same has been found to prevail in all the mines since sunk in this neighbourhood.

There is great uniformity in the *Strata* which are passed through in sinking for brine or rock salt. They very generally consist of clay and sulphate of lime, mixed in various proportions; that of the latter somewhat increasing as the shaft approaches the brine or rock. The workmen distinguish the clay by the appellation of *metal*, giving it the name of red, brown, or blue metal, according to its colour; and the sulphate of lime by that of *plaister*. The strata formed by these are, in general, close and compact; allowing very little fresh water to pass through them. In some places, however, they are broken and porous: and they admit so much fresh water into the shaft, that whenever this shaggy metal, as the workmen call it, has been met with, it has been usual to discontinue any attempts to pass through it. It was thought not only impracticable to overcome a water, which vulgar prejudice had magnified into a great stream running under ground; but it was believed, even if the sinking could be continued below this, that the water could not be kept out of the shaft; and that it would either weaken the brine so as to destroy its value, or would find its way into the cavity of any rock pit which might be found below it. Later experience has proved that these ideas were not altogether well founded. A few years ago an attempt was made in Witton to pass through this porous stratum, in order to get to the brine. It was met with about 28 yards from the surface; the thickness of it, was about 13 feet; and the quantity of water, which was forced through it into the shaft, was 360 gallons a minute. By means of a steam engine, the sinkers were enabled to pass through this water; to fix a guage, or curb, a few yards below it, in a stratum of indurated clay; and thence to bring up a wooden frame, supporting a wall of puddle, 12 inches thick; by which the access of the fresh

Plate I. P. 29.

Section of the STRATA sunk through to the Second BED of ROCK SALT,

at WITTON near NORTHWICH



Numbers	Observations &c	Yds	Feet	Ins
	Soil			
1	Calcareous Marl	5	0	0

fresh water into the shaft was, in a great degree, prevented, and an opportunity given to pass down to the brine below. A shaft was afterwards sunk through this porous stratum, for the purpose of obtaining rock; which object was after a short time defeated, by the influx of brine into the shaft, at the surface of the upper stratum of rock: an accident originating in a cause completely distinct from the fresh water in the porous stratum.

The annexed drawing [Plate I.] contains an exact *Section of the Strata* sunk through at Witton; and all the strata in the neighbourhood of Northwich appear to have nearly a similar disposition. The inclination in this shaft, was from N. W. to S. E.; and the dip about one yard in nine. No. 14 is the stratum through which the fresh water flowed; and the level it found was 16 yards from the surface, which nearly corresponds with that of the brook below. The line of separation between the lowest stratum of earth, and the first of rock salt, is very exactly defined; they are perfectly distinct, and do not at all run into each other. On carrying a horizontal tunnel for 100 yards along the upper stratum of rock salt; this was found to be irregular and unequal on its surface; the irregularities, in great degree, corresponding with those on the surface of the ground above.

Wherever rock salt is met with, sulphate of lime appears to be very generally found mixed with the earthy strata above it. M. de Hassenfratz, in his "*Memoire sur le sel marin*," informs us that this is the case in Poland, Transylvania, and Hungary; and that there is generally a layer of gypsum, betwixt the strata of stone, and the bed of salt. This gypsum is of different colours; and is found crystallized, striated, and mixed with marine shells.* The gypsum above the beds of rock salt in Cheshire, is in like manner found crystallized and striated; but no marine exuviæ, or organic remains, are ever met with in any of the strata†.

The thickness of the upper bed of rock salt, in those pits lying most to the N. E., is thirty yards; and it appears gradually to decline in thickness towards the S. W.: losing, in the course of a mile, five yards. In the pit last sunk in the neighbourhood of Northwich, which is the one most to the S. W., it is only twenty five yards thick.

Jars, who, in his "*Voyages Metallurgiques*," has given the most particular account we have of the upper stratum of rock salt near Northwich, says that, "it appears to have been deposited by layers or beds of several colours;" and he adds that "these layers of salt are in such a position as to lead us to believe that the deposition of it was made in waves, similar to those which are formed on the sea coast." This opinion coincides with an idea suggested to me by my friend Mr. Stanley, relative to the probable origin of the beds of rock salt, now existing in Cheshire. He favoured me with the following communication on the subject.

"The rock salt of Cheshire is found in several strata, one above the other, with intermediate beds of indurated clay, in the valleys of the Weaver, and of many of the rivers and brooks which empty themselves into that river. It has never been found at so small a depth below the surface, as to be above the level of the sea; and never beneath any solid rock. If beds of rock salt are to be considered as so many deposits of salt from sea water, we must suppose the sea at some former period to have occupied the valleys of Cheshire; and that, from time to time, the communications were interrupted between these valleys (then deeper than they are now) and the sea. Earthquakes, or accumulations of sand in the estuaries of the Mersey and the Dee, might have caused these interruptions. Wherever the sea water in the valleys became separated from the sea, the salt contained in it would subside, by the natural process of evaporation. This would the more easily have taken place, if, by any subterraneous fermentation, the ground below the water should have been heated. To account for a greater accumulation of salt than the sea-water filling all the lowest parts of Cheshire could contain, we must suppose the obstruction interposed between the valleys and the sea, to have been repeatedly broken down, and renewed. Tides, unusually high, might occasionally overcome the resistance of the accumulated sand; and if the intervals between the inundations were only of short duration, a subsidence of salt might take place, equal to the formation of the thickest stratum of the rock salt now existing. Long intervals between the inundations would admit of an accumulation of clay, and other earthy particles, over the salt thus deposited; and in this manner would be formed a new basis for another stratum of rock salt to repose upon. Thus the singular and astonishing existence of the salt strata may be accounted for, without necessarily supposing them coeval with the original formation of the earth: but to confirm the theory, much observation, and a close inquiry into the natural history of the county are requisite."

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* Annales de Chymie, Tome onzième, p. 65.

† In Spain, near Cordova, where the rock salt forms a mountain 500 feet high, and three miles in circumference, gypsum does not accompany it, as it usually does in other places. See Kirwan's Mineralogy, Vol. II. p. 31, and Townshend's Travels in Spain, Vol. I. p. 122.

There are however many objections to the theory that the beds of rock salt in this county have been formed by deposition from the waters of the sea; some of which it may be worth while to state, rather for the sake of promoting discussion, than of expressing any very decided opinion on a subject, which in its nature is so extremely uncertain and obscure. On making a perpendicular section of the upper bed of rock salt, an irregular stratification, such as Jars mentions, may by an attentive examination be frequently observed; but the general appearance of the sides of the shaft, or pit, is that of a confused and irregular red mass; in which some portions of salt have a greater, others a less proportionate admixture of earth; while, here and there, they may be seen perfectly pure and transparent. Is it likely that this irregularity and confusion would have existed, had the beds of rock salt in Cheshire been formed by the evaporation of sea water inundating the land at certain intervals of time, as the theory just stated supposes? On the contrary, would it not be natural to expect from reasonings, *a priori*, that the salt thus deposited from sea water would be disposed in layers perfectly regular; and differing from one another merely in thickness, or a few other circumstances of inferior moment? Another fact which invalidates in some measure the opinion that the rock salt has been deposited from the waters of the sea, is the great disproportion

proportion of quantity, ascertained by analysis to exist, between the earthy salts contained in Cheshire brine, and those held in solution by sea-water. The ratio here is as one to ten; or, in other words, the proportion which the earthy salts bear to the pure muriate of soda in sea water, is ten times greater than that which prevails in the Cheshire brine. The ascertainment of this fact proves that the rock salt (from the solution of which the brine is formed) is combined with a much smaller proportion of earthy salts than exists in sea water; a circumstance difficult to be accounted for on the supposition that the beds of this mineral were formed by the evaporation of sea water occupying the valleys and lowest parts of the land. It may be remarked, however, as a fact worthy of attention, that the earthy salts, intermixed with the rock salt in Cheshire, are the same which are held in solution by sea-water; being principally muriated magnesia and sulphate of lime. There is however a circumstance that furnishes an argument, still more strong than any that have yet been mentioned, against the idea that the beds of rock salt in Cheshire, are depositions from sea water; viz. that no marine exuviæ have ever been discovered in the strata. This would almost indubitably have been the case, had the land been covered with sea water, during a period of sufficient length for the deposition of beds of salt of such prodigious thickness; and the circumstance that no such exuviæ do actually exist, is in itself sufficient to induce a suspicion that the theory in question cannot be well founded. Other objections offer themselves to its validity; such as the enormous depth of sea water necessary to the production of a body of rock salt forty yards in thickness; the difficulty, if not impossibility, on such principles, of accounting for the formation of the singular insulated mountain of rock salt, at Cordova, in Spain; with other more trivial ones, which it would be needless to mention, but which will readily occur on a consideration of the subject. At the same time it must be acknowledged, that there are many circumstances and facts of actual observation, which confer a strong degree of plausibility on the opinion against which I have been contending. The certainty that the surface of Cheshire was at some former period much lower than it is at present; and the diminution of the thickness of the strata of rock salt, in proportion as they recede from the sea; are circumstances which undoubtedly range themselves on this side of the question: and upon the whole, it may be doubted whether the theory, which regards the beds of rock salt as deposits from sea water, does not accord more exactly with existing appearances, than any other which can be advanced on the subject. Many of the objections which, at first view, occur to this opinion, may be obviated by a reference to the general principles of the Huttonian theory of the earth; in his excellent illustrations of which theory, Professor Playfair has made some very ingenious remarks on its application to the beds of rock salt in Cheshire. In the present state of our knowledge, however, any opinion founded on the subject, must from its very nature be purely theoretical.*

On making a *horizontal Section of the bed of Rock Salt,* a singular appearance presents itself; on the

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* For some further remarks on this subject, see the Appendix.

whole of the surface made by this section, various figures may be observed, differing in form and size; some of them being nearly circular, others approaching more to an oval form, whilst in others an irregular pentagon may be traced. Some of them are not more than two or three feet in diameter; others are ten or twelve feet. The lines which form the boundaries of these figures are white; and from two to five or six inches wide: on examination, these appearances are found to be owing to the rock salt, in the white lines forming the divisions of the figures, being perfectly pure, and free from earthy admixture. Combined with the salt, having earth in various proportions mixed with it, a general effect is produced, not very distantly resembling mosaic work. (Pl. II. is a representation of a portion of the roofing of a rock pit.) This disposition is uniformly observed through the whole thickness of the stratum of rock salt; and in whatever part of it an horizontal section is made, similar appearances are found. To what causes it has been owing that the rock salt has been deposited in this singular manner, it is difficult to conceive. The whole stratum of rock salt may be compared to a mass of basaltic columns; the lines of separation in each pillar being marked by the pure and transparent white salt.*

The division betwixt the lower portion of the upper bed of rock salt, and the indurated clay or stone beneath it, is as exactly defined as that betwixt the upper portion of it, and the earth above. In passing through

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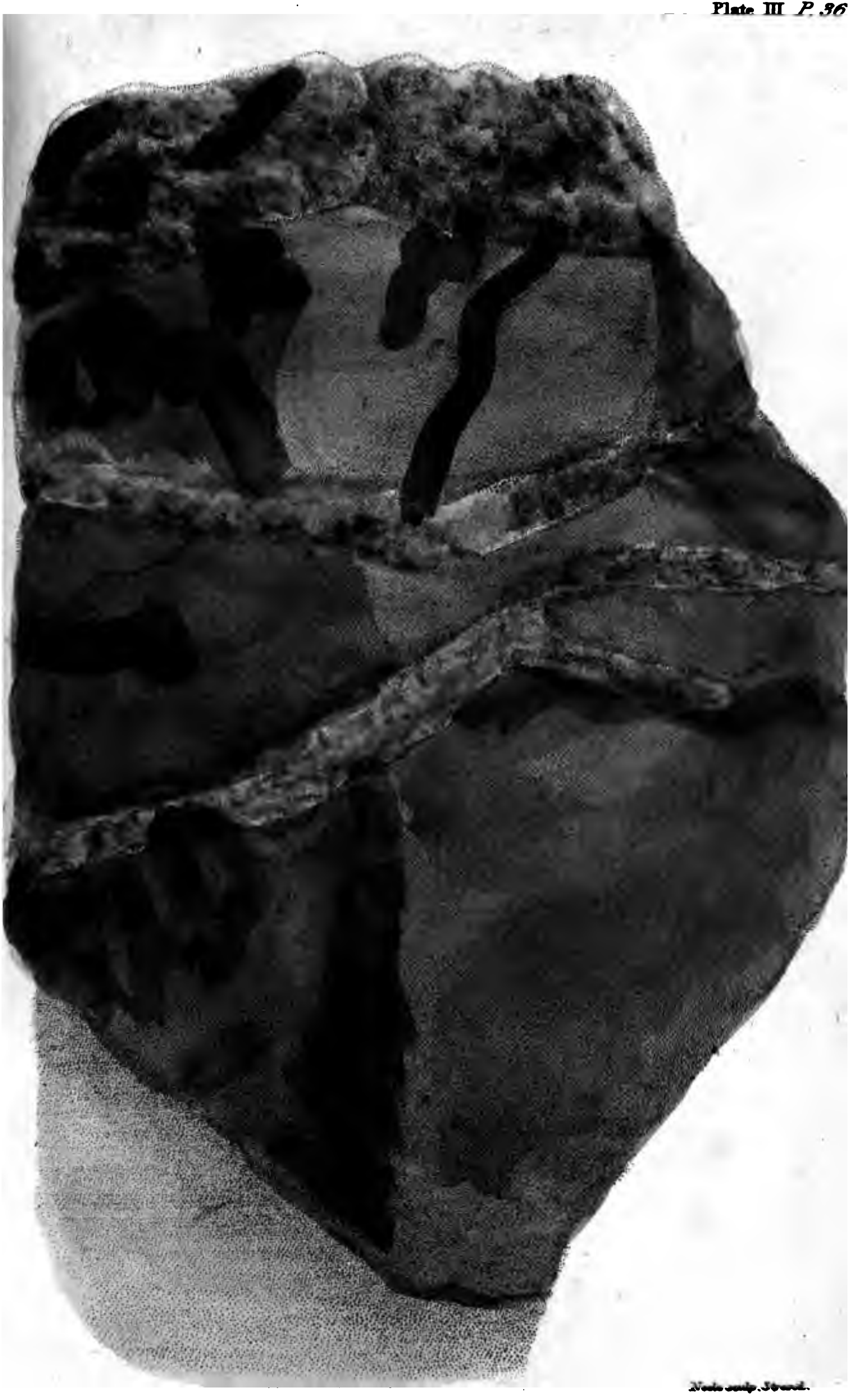
* From these appearances, Professor Playfair has deduced several inferences in favour of the theory of the earth which he has adopted. See his Illustrations of the Huttonian Theory.

Plate III *P. 36*



Neele sculp. Strand.

are at present ten or twelve in number; at all of which the rock is worked in the lower stratum only. The shafts are usually square, and constructed of timber; we find one, however, about a mile from Northwich, circular, and of brick.

With respect to the mode of working, no peculiarity of moment is observable in these mines. By the operation of blasting, and the mechanical instruments usually employed in mining, the rock salt is obtained in masses of considerable size, differing in form and purity. Previously, however, to the extension of the workings in any particular direction, care is taken to secure a good roofing for the cavity which is to be formed. In doing this, the men employ picks of the common description; working horizontally, so as to form a roofing of the rock, and making this as plane as possible. From its situation, a few feet above the purer part of the stratum, the rock obtained during this process is usually of inferior quality, and is for the most part employed in the refineries. The depth of the workings from the roofings depends in a great measure on the nature of the stratum, and the proportion of it occupied by the rock of the purer quality, or, as it is termed, *Prussian Rock*. Fifteen or sixteen feet may perhaps, however, be taken as the average depth of the workings. The cavity thus formed presents a striking appearance; and, when illuminated by candles fixed in the rock, the effect is highly brilliant. In some of the pits the roof is supported by pillars, eight or ten yards square, which are in general regularly disposed; others are worked out in aisles; the choice here however seems to be wholly arbitrary.

Till within the few last years, horses were in every instance employed in raising rock salt, from the pits at Northwich. This method has, however, in some measure been superseded by the improved steam-engine; and the substitution of this invaluable machine has now taken place at several of the pits, out of which rock salt is obtained. At the others, horses are still used. The men employed in working the rock are paid by the ton, usually receiving two shillings for this quantity, they finding both the tools and the powder.

From some experiments made on different specimens of rock-salt, it appears that the transparent rock salt is an almost pure muriate of soda, and contains no admixture of either earth, or earthy salts. The colour of the less transparent and brown specimens is derived from the earth which enters, in greater or less proportions, into their composition.

Experiments.—480 grains of transparent rock salt were dissolved in four ounces of distilled water.

1. On addition of carbonate of potash, there was no precipitate.

2. No alteration was produced by this solution on blue vegetable juices.

3. On addition of a few drops of tincture of galls, a slight purple tinge was given to the solution; and, after standing some hours, there was a brown sediment at the bottom of the phial.

4. On addition of muriate of barytes, there was no precipitate.

The first experiment shews, that the rock salt has no muriate of lime or muriate of magnesia combined with it; the second, that it has no uncombined acid or alcali; the third, that it contains some portion of iron; the fourth, that there is no sulphate of lime contained in it.

On examining different specimens of the less transparent, and the brown rock salt, with the same reagents as in the experiments which have been mentioned, it was found, that these consisted of muriate of soda, combined with a certain proportion of earth, varying in quantity from 1 to 30 per cent. The earth was entirely the argillaceous or common clay. Some of the specimens contained a few grains of sulphate of lime, in 480 grains of the rock salt.

Brine and White Salt.—Previously to the discovery of the beds of fossil salt in Cheshire, various erroneous and absurd opinions were formed, as to the origin of the brine; to enter into any detail of which, would, at the present time, be perfectly useless. Since this discovery was made, no doubt has been entertained, that the saline contents of this fluid are derived from the water of springs, or rain water, penetrating down to the surface of the rock salt, or the head of the rock, as it is usually called, and effecting the solution of a certain portion of the salt, with which it then comes into contact. Several circumstances will, of course, influence the quantum of this solution, or the strength of the brine, some of which it may not be uninteresting to mention. One of the most obvious is, the extent of surface of the rock salt exposed to the action of the water; the greater this is, and the more completely the water and rock salt are brought into contact, the greater will be the consequent solution, and the stronger the brine. Independently, however, of such an immediate operation, the strength of the brine will be varied by the manner in which any pit is worked, and the circumstances attending the raising the brine; for if it is pumped up seldom, it is found to be weaker than it would be, was it drawn up more frequently.* The explanation of this seems to be that the water which finds its way to the stratum of fossil salt, probably remains, in great degree, at rest, till put into motion by raising the brine; while in this state, the portion of it which is immediately in contact with the rock becomes saturated; but acquiring at the same time a greater degree of specific gravity than it had as pure water, it thereby prevents the water above from sinking down so as to act upon the rock; and the sum of solution is consequently less than when the pit is frequently worked, and the rock salt exposed to a more constant action of the water. This is particularly the case in a brine pit, not immediately connected with any other; and the same observations will be applicable to those pits which have a communication; with this difference only, that the mode of working in one pit is to be taken into consideration in the effect produced on the strength of brine in another, independently of its own particular operations. Most of the pits in the neighbourhood of Northwich and Winsford have such a communication at the rock-head, as is made apparent by the brine in one pit having its level lowered, when another pit is at work, at some distance. At Northwich, this has been further evinced when the brine has found its way into the cavity of a rock salt pit, an accident which has frequently occurred. When this has happened, six or eight brine pits, at the distance of nearly a mile from each other, have often been laid dry, and have continued so till the rock pit has been filled, and the brine has again found its level. On some occasions, where the cavity of the rock pit has been large, four or five weeks have elapsed before this has been completed.

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* Dr. Jackson says, "I have tried it myself, that a quart of brine, when the pit had been drawn off three or four days, to supply five or six wich-houses, yielded an ounce and a half more salt, than at any other time, when it had a rest of a week, or thereabouts." Lowthorp's Abridgement of the Philosophical Transactions, Vol. II. p. 553.

"It hath been observed at several salt-springs, that the brine is much stronger at the bottom of the pits, than near the surface; also in dry weather, than in wet; and when the pits are constantly drawn, than when little brine is drawn out of them." Browurigg, page 97.

The strength of the brine will also be materially affected by the quantity of fresh water which finds access to it, either directly through the sides of the shaft out of which the brine is drawn, or by any fissures in the earth with which these are nearly connected. The proportion of salt held in solution, will bear a ratio to the fresh water thus introduced, and to the subsequent opportunity this has of acting upon the rock.

With regard to the quantity of salt, which a given portion of water will, when fully saturated, hold in solution, very different estimates have been formed. These differences appear to have arisen, on some occasions, from confounding a given quantity of brine with the same measure of water, and not discriminating betwixt the quantity of salt contained in the one, and that which the other was capable of dissolving. Other causes of variations in the reports which have been given, appear to have arisen from the different state of the salt used in making the experiments, the specimens of which may have possessed various degrees of dryness, and have contained a larger or smaller proportion of the water of crystallization. The learned bishop of Llandaff, who made several experiments with a view of ascertaining which report came nearest to the truth, made use in these of the pure fossil salt; the proportion of water of crystallization in which is probably little varied. He found that, "he could never dissolve quite six ounces of rock salt, in sixteen avoirdupoise ounces of water,"[*] This result nearly corresponds with that afforded by the experiments of Hoffman,[†] and Brownrigg,[‡] and there is little doubt of its accuracy.

In the establishment of any manufacture for the crystallization of salt, the first objects of consideration, undoubtedly, are the strength and purity of the brine, which is to be used in the manufacture. Independently, however, of these circumstances, the advantages derived from several other adventitious ones, may render it better worth while to manufacture salt from a weaker brine, in one situation, than from a stronger in another. One of the most important points influencing the choice of a situation for the establishment of a manufactory of salt, exclusive of the strength and purity of the brine, is the opportunity it may afford, of erecting this so as to enjoy the advantages of water carriage, as well for the convenience of the exportation of the manufactured salt, as for the ready conveyance of coals to the works. Much too will depend on the price and supply of coals, where the consumption is necessarily so large as it is in this manufacture. The fluency of the spring is another consideration, which, as Dr. Jackson observed, "may be rich or poor in a double sense; for a spring may be rich in salt, but poor in the quantity of brine it affords." The opportunity of strengthening a weaker brine with rock salt, may also render it more advantageous to work this, than a stronger brine differently circumstanced.

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[*] See Watson's Essays, Vol. II. p. 46.

[†] Hoffman de Salinis Halensibus.

[‡] Brownrigg, p. 64.

With respect to the strength and purity of the Cheshire brines, it appears by analysis, that the greater proportion of them possess these requisites in a very superior degree; many of those which are less impregnated with salt, have rock salt in their neighbourhood, affording a ready means of strengthening them; while the springs are in general copious, and coals readily procured, though of late years at a considerably increased price; at the same time, the extension of the navigation of the Weaver, and the contiguity of the Grand Trunk canal furnish every convenience of water carriage.

The workmen, or the *wallers* as they are called,* usually form their estimate of the strength of brine from its specific gravity; and a new laid egg is their common hydrometer. This sinks in pure water; is suspended in water which has a small quantity of salt dissolved in it; and has a greater or less portion of its surface exposed, as the brine holds more or less salt in solution. They also use an hydrometer graduated upwards, like the common spirit hydrometer, the zero point of which is a fully saturated or leach brine; by these means, however, they know only the comparative strength of the different brines, and are not able to ascertain the exact proportion of salt, contained in a given quantity of the liquor.

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* So called from their raising a bank, or a walling, round the pit, by rubbish of long making salt. See Dr. Jackson's account of the Nantwich springs.

Dr. Watson, in his Essays, Vol. v. p. 90, has furnished us with a table of the specific gravity of water impregnated with different quantities of salt, from $\frac{1}{3}$ down to $\frac{1}{1024}$ part of the weight of the water; and knowing the specific gravity of any brine, we may, from this table, form a pretty accurate estimate of the quantity of salt contained in it.

The instrument used by the French for ascertaining the strength of brine, is the hydrometer of Beaumé, which from its ready application is the most useful for the purpose. It has two scales attached to it; the one having reference to weight, the other to measure. The zero point is fixed at the part to which the hydrometer sinks, when immersed in pure water; and the scales are carried downwards to the point of saturation. The scale which relates to weight at once shews, on immersing the instrument in any brine, how much per cent. of salt it contains; and the one referring to measure indicates the quantity of salt contained in a given measure of brine.

In making the following experiments, with the view of ascertaining the strength of several of the Cheshire brines, one of Beaumé's hydrometers was used, the scale of which was, with his usual accuracy, fixed by my friend Mr. C. R. Aikin. A cold saturated solution of the muriate of soda in pure water contains, according to this scale, 27.812 per cent. of this salt; and an ale pint of the London standard brass measure, 6 oz. 12 dr. Some statements have made a saturated brine to contain 33 per cent. of muriate of soda. This difference has probably arisen, as was before mentioned, from the different states of the salt used in making the experiments. What was here employed, was the largest grained of the common salt, previously heated, and dried before the fire, but not so as to decrepitate. In drying, after as much water as possible has been previously drained from it, salt loses about ⅐ of its weight; and if allowance is made for this loss, the difference in these statements will be, in great measure, reconciled. As it is evident the brines would derive a greater degree of specific gravity, from any earthy salts they might contain, in addition to the muriate of soda, they were first tried by the hydrometer as they were drawn out of the pits; and again, after these salts were precipitated by the addition of a solution of carbonate of potash. Though it is obvious that the result afforded by an examination of this kind cannot be minutely accurate; since the muriate of potash left in solution in the brine after this precipitation will somewhat vary its specific gravity; yet the slight variation occasioned by this circumstance cannot be regarded as of much importance. The different brines submitted to trial were taken from the pits after the engines employed in raising them had been pumping for some time, so as to remove any fresh water, which might have passed down from the shafts into the pits, or been accidentally mixed with them. Though continued variations will arise in the strength of the brine in some of the pits, from causes before enumerated, yet it is probable the average strength is not very different from what is stated as the result of the experiments made.

Winsford brine.—This brine contains 25.312 per cent. of pure muriate of soda; and in an ale pint of it there are 6 oz. 1 dr. of this salt. It contains 2.500 per cent. of earthy salts.

Leftwich brine.—This brine contains 21.250 per cent. of muriate of soda; and 4 oz. 15 dr. of this salt in an ale pint of it. Of earthy salts it contains only .625 per cent.

Northwich brine,—contains 25.312 per cent. of muriate of soda, and in an ale pint 6 oz. 1 dr. The earthy salts in it amount to 1.562 per cent.

Witton brine,—contains 23.125 per cent. of muriate of soda, and in an ale pint 5 oz. 7 dr.; the earthy salts in it amount to 1.562 per cent.

Anderton brine.—The brines raised in different parts of Anderton vary in strength from 25 to 26.566 per cent., and contain from 6 oz. to 6 oz. 6 dr. in an ale pint. The earthy salts amount to 1.875 per cent. The strongest of the brines here has a greater specific gravity than a saturated solution of muriate of soda in pure water.

Lawton brine.—This brine contains 25.312 per cent. of muriate of soda; and in an ale pint of it, there are 6 oz. 1 dr. of this salt. Of earthy salts it contains 1.560 per cent.

Roughwood brine.—This brine has a greater specific gravity than a saturated solution of muriate of soda in pure water. It yields 25.625 per cent. of muriate of soda; and an ale pint of it contains 6 oz. 2 dr. of this salt. The earthy salts in it amount to 2.490 per cent.

Wheelock brine.—This contains 25 per cent. of muriate of soda, and an ale pint of it 6 oz. The earthy salts are .625 per cent.

Middlewich brine.—This contains 25.625 per cent. of pure muriate of soda, and an ale pint of it 6 oz. 2 dr. of this salt. The proportion of earthy salts contained in it, is only .625 per cent.*

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* It may here not be uninteresting to compare the strength of the Cheshire brine springs with that of similar springs in France. We have

Experiments.—On examining the brines by reagents, it was found that

1. All the brines gave immediately a copious white precipitate on the addition of muriate of barytes.

2. On the addition of oxalic acid, there was a precipitation in each of them.

3. On the addition of a few drops of tincture of galls, a slight purple tinge was given to the Anderton, Witton, and Northwich brines; and after standing a few hours, there was a good deal of brown sediment at the bottom of the phials. A similar addition to the Winsford, Lawton, Roughwood, Wheelock, and Middlewich brines, produced no immediate change. After standing some hours, there was in each of them a very slight brown sediment.

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have a memoir on the national salt works in the departments of la Meurthe, Jura, Doubs, and Mont Blanc, by citizen Nicholas, an associate of the national institute; who was required, by a decree of the committee of public safety, August 14th, 1795, to visit the national salt-works; to collect all the necessary observations concerning their actual situation; and procure means for their improvement.

It appears from this memoir, that there are three establishments in the department of la Meurthe, namely, at *Chateau Salins*, at *Mozenvic*, and at *Dieuze*; two in the department of Jura, at *Salins* and *Mont-Morot*; one in the department of Doubs, at *Arc*; and two in the department of Mont-Blanc, at *Montiers*, or *Mont-Salin*; and at *Conflans*.

At *Château Salins*, *Mozenvie*, and *Dieuze*, the brine pretty regularly contains from 13 to 14 per cent. of muriate of soda, though, after long pumping, it comes up stronger.

At *Salins* (department of Jura) the average degree of saltness is 11.86 of the hydrometer. At *Mont-Morin*, from $1\frac{1}{3}$ to $8\frac{1}{2}$ of the hydrometer.

At *Arc*, the brine contains from 3 2-7ths to $7\frac{1}{8}$ per cent. of muriate of soda.

The result of a particular analysis of the brine at *Chateau Salins* was, that one pound of the water gave 1 oz. 7 grs. of pure salt; 23 grains of selenite; 75 grains of Glauber's salt; and $81\frac{1}{2}$ grains of muriated lime and magnesia.

4. All the alcalies, fixed and volatile, threw down an abundant white precipitate in each of them.

The first and second experiments indicate sulphate of lime; the third shews the presence of iron in the brines. Those in the neighbourhood of Northwich contain more iron than the others; but even in these it is very inconsiderable in quantity. The precipitate thrown down on the addition of carbonated kali, was found to consist of a mixture of carbonate of lime, and carbonate of magnesia, principally the former.

Rent of Brine Springs.—It appears from Doomsday book that the king had formerly a claim on all the brine springs in Cheshire. In the time of Edward the Confessor, "there was a brine spring at Namptwich, and eight salterns betwixt the king and earl Edwin; of which the king bore two thirds of the expences, and received two thirds of the returns; the earl the other third." The earl had also a saltern for the particular use of his own family: if, however, he sold any salt from this, the king had two thirds of the receipts, the earl one third. Several private individuals had also salterns for the use of their own families; but if they sold any salt, a certain sum was paid to the king.

No right over these springs is now claimed by the crown; and they are the sole property of the owners of the land in which they are found. Few of them, however, are occupied by the land-owners; and they are in general let out to tenants, either at a fixed annual rent, without any restriction as to the working them, or at a rent proportioned to the extent of the manufacture, and the quantity of salt made.

Modes of raising the Brine.—From the pits in which the brine is found, it is pumped up into cisterns, or reservoirs formed near the works. In a few situations which admit of the assistance of a stream of water, the brine is raised by this means. This is the case at Lawton, at Roughwood, at the old works at Wheelock, and at one of the pits both in Northwich and Middlewich. Where this assistance could not be procured, it was formerly the custom to draw it up by horses.* As the demand for salt increased, in addition to these, small windmills were employed in raising the brine; with the increasing consumption, various inconveniences were found to arise from trusting to a machine depending on the uncertain operation of the weather; which led to the use of steam engines; and at almost all the newly erected works, the brine is raised by means of these.

The *reservoirs*, into which the brine is pumped up, are either large ponds, formed in clay, and generally lined with brick, capable of containing the consumption of several weeks; or they are wooden cisterns, pitched within; which will hold a supply of brine for the consumption of a few days only.

From the account which has been given of the Cheshire brines, it will have been seen that the greater number of them contain a very large proportion of salt, and that many of them very nearly approach to saturation. Though however approaching to this, there are none of them which are completely saturated, or which will not dissolve an increased portion of salt; and as it is of so much importance in the economy of the fuel, to have as little superfluous water as possible to evaporate, it is always an object with the manufacturer to obtain a fully saturated brine. Where then either the brine is weak, or a convenient opportunity is found of saturating a brine already strongly impregnated with salt, this is done by placing a quantity of rock salt in the cistern into which the brine is pumped, and allowing the liquor to act upon it, till it is entirely saturated. A strong wooden frame is fixed in the cistern, at about half its depth, upon which the rock salt is thrown; and the earthy residuum is occasionally removed from thence, after all the salt has been dissolved.*

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* In Camden's time even the assistance of horses was not called in for raising the brine. He says, "At Northwich there is a deep and plentiful brine-pit, with stairs about it, by which, when they have drawn the water in their leathern buckets, they ascend, half naked, to their troughs, and fill them, from whence it is conveyed to the wich-houses." *Camden's Britannia*, p. 561.

From the reservoirs the brine is drawn, as it is wanted, through wooden pipes, or by troughs into the *evaporating pan.*

The pans used in Cheshire, for the evaporating of the brine, are now made of wrought iron. The dimensions of these vary very much; but, in general, those of modern erection are considerably larger than what were in use a few years ago; and they usually contain from 600 to 800 superficial feet.† One or two pans of still larger dimensions have been erected, containing each nearly 1000 feet. Their usual form is that of an oblong square, and their depth from 12 to 16 inches. (See Plate IV. fig. 1.) To a pan containing from 6 to 800 superficial feet, there are usually three furnaces, from six and a half to seven feet long; and 20 to 24 inches wide. The grates are from two and a half to three feet from the bottom of the pan. The furnace-doors are single, and there are no doors to the ash-pits.

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* It is probable that this mode of strengthening a weak brine was put in practice soon after the first discovery of the rock salt. Dr. Leigh claims the merit of having first introduced it. *See Leigh's Natural History of Lancashire and Cheshire*, p. 43.

In like manner the sea or river water slightly impregnated with salt, is brought to a perfect state of saturation, by the addition of rock salt; and works for the preparation of white salt from such a solution, are erected at Frodsham, near the junction of the Weaver with the Mersey, and on the Lancashire banks of the Mersey. The rock salt is conveyed down the Weaver to these works, and is there refined.

† No circumstance more strongly gives us an idea of the increase of the manufacture, than the different dimensions of the reservoirs and pans used now, and those used two centuries ago. Camden, in his account

The different pans are usually partitioned out from each other, and there is a separate *pan-house* to each pan. Within this pan-house, at one end is the coal-hole; the chimney occupies the other end; there is a walk along the two remaining sides of the pan, five or six feet wide; and between these walks and the sides of the pan-house, which are generally of wood, long benches, four or five feet wide, are fixed, on which the

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account of Namptwich, says, "there is but one salt pit here (they call it the brine-pit) distant about 14 feet from the river. From this brine-pit, they convey salt water by wooden troughs into the houses adjoining, where there stand ready little barrels fixed in the ground, which they fill with that water; and at the notice of a bell, they presently make a fire under their leads, whereof they have six in every house for boiling the water. These are attended by certain women called *wallers*, who, with little wooden rakes, draw the salt out of the bottom of them, and put it in baskets, out of which the liquor runs; but the salt remains and settles." *Camden's Britannia, translated by Gibson*, p. 560.

Dr. Jackson, in his account of the Namptwich salt springs, says, "they formerly boiled their brine in six leaden pans with wood fire; in the memory of many alive, they changed their six leads into four iron pans, something better than a yard square and about six inches deep, still fitting the contents of these to that of the six leads." *Lowthorp's Abridgement of the Phil Trans* Vol. II. p. 314.

It appears from Jar's account, that when he visited the salt works at Northwich, about 50 years ago, the largest pans used there were only 20 feet long by 9 or 10 broad. Those at the works at Liverpool for refining rock-salt were 21 feet by 20 feet.

salt is placed in conical baskets to drain, after it has been taken out of the pan; (See Plate IV. fig. 2.) a wooden or slated roof is placed over the pan-house, with l'œuvres to allow the steam to pass freely out.

After the brine has been drawn from the cistern into the evaporating pan, the process of the manufacture is varied, according to the state in which it is wished to have the salt procured, and the uses to which it is intended to be applied. The effects of these variations will be best understood, by first examining what is the process of nature in forming the crystals of muriate of soda; and then by stating the different ways in which the manufacture is conducted.

The natural form of the crystals of muriate of soda, is that of a perfect cube; and they regularly assume this figure, when the due arrangement of their particles has not been interrupted by agitation, or the application of strong heat. "These cubes exhibit diagonal striæ, and frequently on each side produce squares, parallel to the external surface, gradually decreasing inwards; circumstances which shew the vestiges of their internal structure: for every cube is composed of six quadrangular hollow pyramids, joined by their apices and external surface; each of these pyramids filled up by others similar, but gradually decreasing, completes the form. By a due degree of evaporation, it is no difficult matter to obtain these pyramids separate and distinct; or six of such, either hollow or more or less solid, joined together round a centre. If we examine the hollow pyramid* of salt farther, we shall find it composed of four triangles,

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* The bases and altitudes of these little pyramids are in general equal; thus shewing the disposition of the salt to form a cube.

Fig: 1. Side View of a Salt Pan when erected.

A. The Pan.
B. The Door.
C. The Grate.

D. The Flue.
E. The Chimney.
F. The Damper.

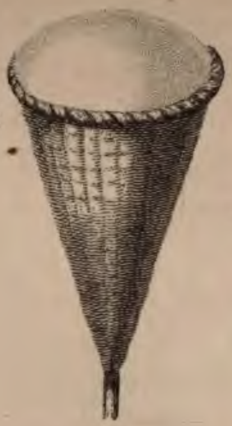

Fig: 2.

Fig: 2. Salt Basket.

Scale ¼ of an Inch to a Foot.

1 2 3 4 5 6 7 8 9 10 feet.

Scale for Salt Pan.

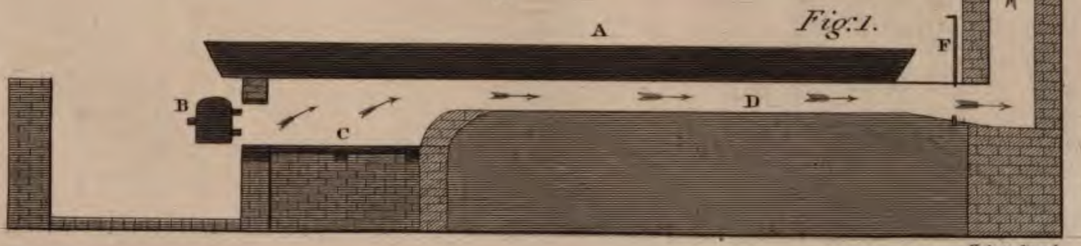

Fig: 1.

Neele sc. Strand.

and each of these formed of threads parallel to the base; which threads, upon accurate examination, are found to be nothing more than series of small cubes."* The perfect crystallization of the salt can, however, take place only under the circumstances above mentioned, a freedom from agitation, and from too rapid an evaporation of the water which holds the salt in solution: and it is principally on the presence or absence of these causes, that the variation in the appearance of the manufactured salt depends.

The manufacture is conducted in several different ways, or rather heat is applied in various degrees, to effect the evaporation of the water of solution; and according to these different degrees of heat, the product is the stoved or lump salt; common salt; the large grained flaky; and large grained or fishery salt.

In making the *stoved*, or *lump salt* as it is called, the brine is brought to a boiling heat; which in brine fully saturated, is 226 degrees of Fahrenheit. Crystals of muriate of soda are soon formed on the surface; and almost immediately, by the agitation of the brine, subside to the bottom of the pan. If taken out, each of them appears, at first sight, to be granular or a little flaky; but if more accurately examined, it is found to approach to the form of a little quadrangular, though somewhat irregular, pyramid. The boiling heat is continued through the whole process; and, as the evaporation proceeds, similar little crystals continue to form themselves, and to fall to the bottom of the pan. At the end of twelve hours, the greatest part of the water of solution is found to be evaporated; so much only being left as is sufficient to cover the salt and the bottom of the pan. The fires are then slackened, and the salt is drawn to the sides of the pan with iron rakes. The waller then places a conical wicker basket, or barrow as it is called, within the pan; and having filled this with salt, by means of a little wooden spade, he suffers the brine to drain from it for a short time into the pan; and then carries it to one of the benches, at the side of the pan-house, where the draining is completed. It is afterwards dried in stoves, heated by a continuation of the same flues which have passed under the evaporating pan, and is reckoned to lose in this about $\frac{1}{7}$th of its weight. In making this salt the pan is twice filled in the course of twenty-four hours.

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* See Bergman's Essays, Vol. II. p. 12 and 13.

On the first application of heat, if the brine contains any carbonate of lime, the acid may be observed to quit the lime, and this being no longer held in solution, is either thrown up to the surface, as the ebullition takes place, along with the earthy or feculent contents of the brine, whence it is removed by *skimmers*; or it subsides to the bottom of the pan, along with the salt first formed, and with some portion of the sulphate of lime; and is raked out in the early part of the process. These two operations are called *clearing* the pan; some of the brines scarcely require them at all, and others only occasionally.

An analysis of these *clearings* was made by my friend, Mr. William Henry. He found 480 parts, containing 384 of muriate of soda, 20 of carbonate of lime, and 76 of sulphate of lime. Circumstances however are continually occurring to vary these proportions, even in the same brine; and the proportion is generally less than he found it.

In making the *common salt*, the brine is first brought to a boiling heat, as in making the stoved salt; with the double view of bringing it as soon as possible to a state of perfect saturation, and of more readily clearing from it any earthy contents. When these purposes have been effected, the fires are slackened, and the crystallization is carried on with the brine heated to 160 or 170 degrees of Fahrenheit. The salt formed in this process is in quadrangular pyramids or hoppers, close and compact in their texture, frequently clustered together, and larger or smaller according to the degree of heat which has been applied. Little cubical crystals will often be intermixed with, and attached to these. The remainder of the process is similar to that of the stoved salt, except that after draining in the baskets, it is immediately carried into the store-house and not afterwards exposed to heat. The pan is filled only once in 24 hours in making this salt.

The *large grained flaky* salt is made with an evaporation conducted at the heat of 130 or 140 degrees. The salt formed in this process is somewhat harder than the common salt, and approaches nearer to the natural form of the crystals of muriate of soda. The pan is filled once in 48 hours. As salt of this grain is often made by slackening the fires betwixt Saturday and Monday, and allowing the crystallization to proceed more slowly on the intermediate day, it has got the name of *Sunday salt*.

To make the *large grained* or *fishery salt* the brine is brought to a heat from 100 to 110 of Fahrenheit; and at this heat, the evaporation of the water, and the crystallization of the salt, proceed. No agitation is produced by it on the brine; and the slowness of the evaporation allows the muriate of soda to form in large, nearly cubical crystals, seldom however quite perfect: with this heat it takes five or six days to evaporate the water of solution.

In the course of these several processes various additions are often made to the brine, with the view of promoting the separation of any earthy mixture, or the more ready crystallization of the salt. These additions have been different at different works; and many of them seem to have been made from particular, and often ill-founded prejudices; and without any exact idea as to their probable effects. The principal additions which have at various times been made are, acids; animal jelly and gluten; vegetable mucilage; new or stale ale; wheat-flour; resin; butter; and alum.

Acids have not been much used at any time in Cheshire as an addition to the brine; and it is extremely doubtful whether any good effects arise from their use. The Dutch were long famous for their skill in the art of preparing salt; and when it became known that they were accustomed, during the crystallization of the salt, to add to their brine a quantity of whey, kept several years till it became extremely sour, the superiority of their salt was supposed to be owing to this addition.* It was imagined that, during the boiling of the brine, a certain portion of the muriatic acid was dissipated by the heat, and that the acid of the whey united itself with the uncombined alkali, and prevented the excess of it from injuring the quality of the salt. There seems reason to believe, as will be hereafter shewn, that this opinion was not well-founded; and that the superiority of the Dutch salt was owing solely to the gentle fires with which they carried on the evaporation, and not to the acid added to the brine. This addition is now never made at any of the works in Cheshire.

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* See Brownrigg, p. 118 and p. 144; and Watson's Essays, Vol. II. p. 64.

Animal jelly and *gluten* have been much used for clearing the brine, and promoting the separation of the earthy contents. The application of these to the same purpose in wine and other fermented liquors, and their effect in freeing these from any feculent matter contained in them, is well known; and they seem to have a similar mode of action when added to brine. The substances of this kind which have been used are, blood; whites of eggs; glue; and calves' or cows' feet. Blood has been long used as an addition to brine for the purpose of clarifying it. Dr. W. Jackson, in his account of the salt-making at Namptwich, in 1670, says, "they put into the pans amongst their brine a certain mixture made of about 20 gallons of brine and two quarts of calves', cows', or sheep's blood mixed into a claret colour; of this mixture they put about two quarts into a pan that holds about 360 quarts of brine; this bloody brine at the first boiling of the pan brings up a scum which they are careful to remove with a skimmer." Blood is still occasionally used at some of the salt works in Cheshire,* and, when fresh, is found highly useful; but the difficulty of procuring it in the quantity wanted, and of keeping it without putrefaction, are objections to its general use. *Whites of eggs* have been frequently added to the brine for the same purpose as blood. In the account which Dr. Rastell gives of the salt works at Droitwich, he says; "For clarifying the brine we use nothing but whites of eggs, of which we take a quarter of a white, and put it into a gallon or two of brine; which being beaten with one's hand, lathers as if it were soap; a small quantity of which froth, put into each phat, raiseth all the scum, so that the white of one egg will clarify 20 bushels of salt." He adds, "this salt is as white as any thing can be; neither has it any ill savour, as that salt which is clarified with blood."* The whites of eggs are not much used in Cheshire for clearing the brine. It is not supposed that they would not answer the purpose, but the same object is effected by means less expensive. *Glue* is frequently used for clearing the brine, and is found to answer the purpose perfectly well; and this is the only substance used at many works. The addition most frequently made to the brine for assisting in clearing it, is the jelly procured by boiling *cows'* or *calves' feet*. The consumption of these at some of the works is very considerable. They are salted, dried, and laid up ready for using. When wanted, they are either boiled in a separate pan, and the broth carried to the evaporating pan; or a stew-pot is placed in one of the corners of the evaporating pan, and the feet being put into this, the jelly is extracted from them by the heat of the brine in the pan, and is added as the waller sees occasion. *Vegetable mucilage*, as that of linseed, has been occasionally used for clearing the brine, and has been found to produce the same effect as animal jelly; but an inconvenience attends the use of it in the large way; it becomes putrid soon after it is prepared, and then loses its mucilaginous quality. It seems probable that *new* or *stale ale*, which were long used as additions to the brine for clarifying it,* could have effect only as they contained a certain proportion of vegetable mucilage. The spirit in the ale would soon be evaporated; and there is reason to think that any acid contained in it would be of no use, as was mentioned in speaking of the acid whey. Neither this, nor *beer grounds*, which were formerly much used, are now employed in Cheshire. *Wheat-flour* and *resin* have each been occasionally added to brine, where the manufacturer has wished to produce a salt of small grain.† The mucilage extracted from the flour may have some effect in separating the earthy parts of the brine; but it is probable that these additions act mechanically; and by the interposition of their small particles betwixt the minute crystals of salt may prevent the cohesion of these, and thus keep the grain small. These additions are rarely made in Cheshire.

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* It is the only substance used at Birtley in Durham for clarifying the brine.

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* Philosophical Transactions abridged, Vol. II. p. 358, 359.

Butter or some other oily substance is very generally added to brine during the evaporating process, and after the clearing has been made, to assist the granulation of the salt, and to make the brine "work more kindly." Dr. Brownrigg seems to think it produces no good effect, and that "the salt-boilers have little to plead in its favour, besides immemorial custom." This opinion of his appears not to have been well founded; and the experience of the wallers leaves little room for doubting that the addition of the butter enables the salt to crystallize more readily. While the evaporating process is going on, it frequently happens that an adhesion takes place betwixt the sides of the little crystals of salt, which form on its surface; and that, instead of falling to the bottom of the pan, these adhere together, producing a kind of incrustation to a considerable extent on the surface of the brine, which prevents the evaporation from going on regularly, and by confining the steam occasions the brine underneath to acquire too much heat. When a crust of this kind forms, the salt boilers say that "the pan is set over:" it is somewhat raised above the surface of the brine, is usually of an opaque whiteness, and has lost a large part of its water of crystallization. The great use of butter seems to be to prevent the pan from "setting over." If a very small portion of this or any other oily substance is added to the brine in one of the largest pans, it may be seen in a very few minutes to diffuse itself over the whole surface, and in its progress to occasion any crust, which may have been formed on the brine, to subside to the bottom of the pan. At the same time a great steam is observed to rise; the superabundant heat is carried off; and the crystallization afterwards proceeds with regularity.

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* See Brownrigg, p. 114.

† See Brownrigg, p. 110 and 111; and Dr. Rastell's account of the Droitwich salt works. Philosophical Transactions abridged, Vol II. p. 358.

The salt boilers have long been in the habit of adding *alum* to their brine, when they wished to procure a hard firm salt, of large grain.* From Mr. Lowndes' account of his process, in his treatise entitled, "Brine salt improved," it appears that he considered the addition of this, as his greatest improvement; and to it he ascribed the supposed superiority of his salt, as it gave it a proper hardness.[*] Dr. Brownrigg, on the other hand, remarks, "that the grains of salt will always be sufficiently firm and hard, of their natural figure, and of a large size; if formed by a gentle heat; so that the goodness of Mr. Lowndes' salt, does not seem to be owing to the alum with which it is mixed, but may be attributed chiefly to the gentle heat, used in the preparation."[†] Notwithstanding the opinion which Dr. Brownrigg entertained on this subject, the addition of alum does appear to assist in promoting the crystallization of the salt in large grains; but in what manner its effects are produced, I am unable to ascertain. According to Fourcroy a double decomposition of the sulphat of alumine, and muriate of soda, would take place, on mixing a solution of these salts; but this affords no explanation of the effect which all the workmen, of whom I have made enquiry, agree that alum produces; since only three or four pounds of alum are added to a quantity of brine capable of yielding as many tons of muriate of soda.

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* See Dr. Leigh's Natural History of Cheshire and Lancashire, p. 44.

By the application of heat and the assistance of the different additions which have been mentioned, a large proportion of the carbonates of lime, and of iron, if any are contained in the brines, is separated and cleared out. Some part of these is still left in the pan, and as the evaporation proceeds, subsiding to the bottom, together with the sulphate of lime, they form an incrustation there, called by the workmen *pan-scratch* or *scale;* which gradually accumulating along with such portion of the muriate of soda, as is mixed with them, it becomes necessary to remove from the pan, every three or four weeks, by *picking;* an operation consisting in the separation of this scale from the pan, by heavy blows with sharp iron picks. These pickings were analysed by the excellent chemist beforementioned, Mr. William Henry. He found 480 parts of them to contain 40 of muriate of soda, 60 of carbonate, and 380 of sulphate of lime. Circumstances of course are occurring to vary these proportions. Where the brine is weak, the proportion of muriate of soda is still smaller than in Mr. Henry's analysis; since on any fresh addition of brine to the pan, the muriate of soda which had been deposited, would be redissolved; on the contrary, if the brine approached to saturation, it would remain united with the scale upon the pan.

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[*] See Lowndes' Treatise, p. 13.

[†] See Brownrigg's Essay, p. 118.

The pan-scratch accumulates most towards the close of the evaporation; for when there is much salt deposited in the pan, it forms such a heavy mass at the bottom, that the water cannot penetrate into it, and hence the portion which is lowest undergoes a sort of calcination and fusion, which gives it extreme hardness, and a very strong adhesion to the pan.*

We have remarked that the salt formed from the same brine, by the application of different degrees of heat, varies very much in external appearance: and it has been generally imagined that the salts produced by these variations in the process of the manufacture, were equally different from each other in their component parts, and in their qualities, as in outward form. It has also been the prevailing opinion, that any salt formed from natural brine was inferior in its power of preserving animal flesh from putrefaction to bay salt, or the salt procured from sea water. It is of much importance to ascertain, how far the ideas which have been formed on these different points, are well founded; that if they owe their origin to groundless prejudices, these may be removed; that if, on the contrary, there is any foundation for them, the causes of the difference in the quality of the salt made from the same brine, and those of the inferiority of the salt made from natural brine, to that from sea water, may be ascertained.

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* At Salins, and at several of the salt works in France, the scales picked from the pans are lixiviated, in order to extract from them the muriate of soda they contain. When the water has acquired a strength of 14 per cent. it is added to the brine in the pans. See Memoir on the National salt works of France by Citizen Nicholas.

It is allowed by all that pure muriate of soda is the salt, of all others known, which is best fitted for the preservation of animal flesh, and provisions of every kind; and that the goodness of any salt depends on its containing a perfectly neutralized muriate of soda, free from the admixture of other alkaline or earthy salts.

The difference in the quality of the salt made by a boiling heat, and that by a low degree of heat, has been supposed to be owing,

1. To a portion of the muriatic acid being expelled from the muriate of soda, by the high degree of heat, while a superabundance of alkali has been left.

2. To the greater combination of the earthy salts contained in the brine with the muriate of soda, by the agitation in the boiling process.

The opinion that when a boiling heat was applied to brine, a portion of the muriatic acid was dissipated by the heat, has been a very prevailing one; and seems to have originated in some experiments of the learned

These experiments seem fully to confirm the opinion that no portion of the muriatic acid is dissipated, even by a much greater heat than that of boiling brine.*

The greater proportion of earthy salts combined with the muriate of soda, has been assigned as another reason for the greater supposed weakness of the salt prepared from natural brine by a boiling heat.† We have no account of any experiments made with a view of ascertaining to what this greater proportion amounted. It seems to have been rather taken for granted that it existed, from its having been observed that salt of small grain, or that prepared by a boiling heat, more readily attracted moisture from the air; whilst the opinion has been held that muriate of soda, when pure, rather becomes dry than acquires moisture:‡ and by its having been found by experience that the salt thus prepared, did not answer equally well with the bay salt, or the large grained fishery salt, in the curing of fish, or packing provisions.

Experiments.—480 grains of stoved salt were dissolved in four ounces of water.

1. A precipitate was produced by a solution of carbonate of potash, which, when dried, amounted to three grains only; and was found to consist of carbonate of lime, and carbonate of magnesia.

2. On adding muriate of barytes, there was a white precipitate.

On making similar additions to a solution of large grained fishery salt, prepared by an evaporation conducted at 110 degrees of Fahrenheit, the result was the same, excepting that the precipitate, on the addition of the solution of carbonate of potash, amounted to one grain only.

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* Attempts have been made to alkalize salt by mixing it with charcoal, and exposing it to an intense heat, but without success.

† See Brownrigg, p. 232, and Watson's Essays, Vol. II. p. 62.

‡ See Fourcroy's Elements of Chemistry, Vol. I. p. 443.

The above experiments serve to shew that the proportion of earthy contents, even in the salt prepared by a boiling heat, is extremely inconsiderable; and much too small to have any influence in affecting its power of preserving animal flesh and provisions. Indeed, if we refer to the analysis of the different Cheshire brines, and observe the small proportion the earthy salts in any of these bear to the muriate of soda; when we recollect further that a considerable part of even this small proportion, is either removed in the clearing of the pan, or deposited in the scale, at the bottom of the pan; we should scarcely, *a priori*, expect to find a larger proportion mixed with the muriate of soda, than actually appears by the experiments.

If then the small grained salt prepared by a boiling heat, has no superabundance of alkali (See Experiment, p. 59), and has so small an admixture of earthy salts (See Experiments, p. 61), how comes it to pass that it both attracts moisture from the air, and is less fitted for the preservation of provisions than the large grained or bay salt?

Before attempting to answer these questions, I would be permitted with every deference to the high authorities which have given a contrary opinion, to express my doubts of "pure muriate of soda, rather becoming dry, than attracting moisture from the air." Muriate of soda, even when perfectly pure, certainly appears to be a *deliquescent* salt. The experiments on the clear transparent fossil salt (p. 36) seem to shew that this contains no admixture of earthy salts, but that it is a

pure

pure muriate of soda. Now it is perfectly well known that this attracts moisture from the air, in no inconsiderable degree. The countryman suspends a piece of it from the top of his room, and considers the dryness or moisture of it, a good criterion of the weather he has to expect. In like manner, the large grained fishery salt, which, it has appeared, contains only one grain in 480 of earthy salts, and which the more complete form of its crystals proves to be nearly a pure muriate of soda, becomes moist in a moist atmosphere. That the salt of small grain, which is less hard and compact in its texture, should attract more moisture, is the natural effect of its greater extent of surface; and from the same causes it produces a different effect on the organs of taste; but from no analysis of it does there appear reason to believe, that these circumstances are owing to any combination with it of salts having an earthy basis.

As a still further proof that the stoved salt, or the salt prepared by a boiling heat, and the large grained salt, or that prepared by a low degree of heat, though differing in form, have scarcely any difference in their component parts, we have only to re-dissolve a portion of each in pure water. By applying to the solution of the large grained salt a boiling heat, we obtain a granular flaky salt, resembling stoved salt; while on the other hand, by carrying on the evaporation of the water of solution of the stoved salt at a heat of 100 degrees, we obtain large cubical crystals of muriate of soda; and these operations may be repeated, *ad infinitum*, with correspondent results. The component parts of these two salts are in fact the same: their only difference is in outward form, and in the hardness and compactness of their crystals.

Though however differing little in purity; and though from the experiments which have been given, it has appeared that they were each nearly a pure muriate of soda; yet it will readily be conceived that their difference in form and in compactness, may fit them for very various application in the preservation of animal flesh and provisions.

For table use, for the salting of butter, and for various domestic purposes, a preference is given to the salt prepared by a boiling heat; the smallness of its grain better fitting it for these purposes.

For the same reason, and from its consequent readiness of solution, this salt is well adapted for making the pickle for *striking* the meat, which is the first part of the process in curing fish, and preserving animal flesh.

For the *packing* of fish and provisions, it is by no means so proper as the common or large grained fishery salt; and, as might be expected, it is found, when applied to this purpose, not to preserve them equally well from putrefaction. This however arises, not from any want of purity in the salt, nor from any admixture of earthy salts with it; but from its small grain, and its want of hardness and compactness, derived from its containing more of the water of crystallization than the larger grained salt. Being so ready of solution, the whole of it is formed into brine; which being forced out from betwixt the layers of flesh or fish, by the pressure of these on each other, the different portions of animal matter come into close contact, without having any salt interposed. Whereas when the salt of larger grain is used, a considerable part of it long remains undissolved; separating the different portions of meat; admitting, in some degree, the brine to flow betwixt the layers; and furnishing a constant supply of saturated brine, from the solution of the salt in the fluids exuding from the animal matter, to every part of the packed provisions.*

The action of bay salt is exactly similar to that of the large grained salt; and neither the one nor the other appears to have any advantage over the salt prepared by a boiling heat, except in the size and compactness of its crystals; and in its containing a somewhat smaller proportion of the water of crystallization: and as the large grained fishery salt, prepared by a low degree of heat from natural brine, is more than equal to the bay salt in these important points; there can be no doubt, whatever prejudices to the contrary may have existed, that it at least equals the latter in its power of preserving animal flesh, or provisions.

Experience, however, has much more weight than any theory on the subject. This experience we have, on an extensive scale, at the navy office at Deptford, where the large grained salt, manufactured in Britain from natural brine springs, has for several years been the only salt used for *packing* provisions; after they have been first salted with common salt, or that prepared by a heat of 180 degrees. Though these provisions have been afterwards carried to the hottest climates, the strength and purity of the salt used in preserving them have never been called in question. The provisions have kept perfectly well; and it has never been doubted that the salt here used, was in every respect equal to the St. Ubes salt; or to any other salt prepared from sea water, by the natural heat of the sun.†

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* See a paper on the manufacture and quality of Cheshire salt, in the Monthly Magazine, for June 1804.

† What is sold in London as bay salt, is almost entirely the large grained salt of home manufacture from natural brine springs.

Fuel used in making salt.—The progress of improvement in any art, especially in the early and unlettered ages, has usually been made by slow and gradual advances. Simple as the process of making salt from brine, by the application of heat to an evaporating vessel, now appears; it was long before the manufacture attained this degree of perfection. The rude mode of preparing it consisted only in pouring the brine upon burning wood, for which the oak and the hazel were preferred, and then collecting the salt deposited upon the ashes of the wood.* When evaporating vessels were at length brought into use, wood was the only fuel employed to effect the evaporation. Camden, speaking of the salt works at Droitwich, says, "what a prodigious quantity of wood these salt works consume, though men be silent, yet Feckenham forest, once very thick with trees, and the neighbouring woods will by their thinness declare daily more and more."† King published his Vale Royal in 1656; and it appears from his account, that wood continued to be the fuel at that time most used at the Cheshire salt works; and that a general preference was given to it. Coal however began to be employed at, or about that period; and King mentions, as a new and singular circumstance, that it had been substituted for wood at some recently erected salt works above Namptwich.‡

The considerable extension which has taken place during the last century in the manufacture of salt in Cheshire, has been necessarily accompanied with a proportionate demand for fuel; and the use of wood, of which it would have been impossible to have found a supply at all adequate to the consumption of the different salt works, is now entirely discontinued, and coal substituted for it.

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* See Plinii Hist. Nat. XXXI. c. 7, & Varro de re rusticâ, L. 1. c. 6.

† Camden's Britannia, p. 518.

‡ King's Vale royal, p. 66.

At Winsford, Northwich, Anderton, and all the works contiguous to the Weaver, the supply of coal is obtained from the collieries in the southern part of Lancashire, in the neighbourhood of St. Helens. The flats which convey the salt from the different works down to Liverpool, after discharging their cargoes there, return up the Mersey to the Sankey canal, where they procure a loading of coal for back freight. The price of the coal, at the pits, has been considerably increased within the last few years; and including the different subsequent expences from tonnage, freight, &c. the cost of it laid down at the salt works is from 13*s*. to 14*s*. per ton.

The importance of having a supply of this article, convenient of access, and moderate in price, may be conceived from a statement of the quantity annually brought up the Weaver, for the supply of the works in its immediate neighbourhood. Taking the average of the last ten years, ending April 5th, 1806, I find that 57,780 tons have been brought up to Northwich, Anderton, and Witton; and 30,860 to Winsford; making a total annual average of 88,640 tons. The last of these ten years, the quantity brought up exceeded that of any former year. To Northwich, Anderton, and Witton it amounted to 70,580 tons; and to Winsford, to 36,460 tons; making a total of 107,040 tons.

The entire quantity of coal thus conveyed up the Weaver, it is true, is not consumed in the manufacture of salt; a small proportion of it being applied to domestic purposes at Northwich, Winsford, and their neighbourhood; but this cannot amount to a tenth part of the whole consumption, probably much less. The remainder is used in the manufacture of salt.

The proprietors of the salt works at Lawton, Roughwood, Wheelock, and Middlewich, which are situated near the Staffordshire canal, find it more convenient to procure their supply of coal, from the collieries in Staffordshire; and they have it laid down, nearly on the same terms at which it is procured for the other works out of Lancashire.

A statement of the quantity of rock, and white salt sent down the Weaver, and exported from Liverpool, is given under the article *Commerce*,

SECT. VI.—WATER.

CHESHIRE may be esteemed, in general, a very well watered tract of country, being intersected in almost every direction by numerous streams, many of them of considerable magnitude. This indeed is a natural consequence of the great quantity of rain falling in the county, and particularly on the hills which separate it from Derbyshire. In these hills a number of small streams take their rise; and pursuing, for the most part, a north-westerly course, empty themselves into the Mersey, or into some stream joining this river. Whether the Mersey itself can with propriety be called a Cheshire river, is somewhat doubtful. From Stockport, where it first receives that name, to the Irish sea, it forms a natural division between Cheshire and Lancashire; communicating to each county, in different degrees, all the advantages of an inland navigation.

As it receives however much the largest proportion of its water from Cheshire, and is extremely important to this county in many points of view, it will be proper here to notice it more particularly.

The Mersey originates in the junction of several small streams, at the extremity of the north-eastern horn of Cheshire; and forming for thirteen miles the southern boundary of this projection, under the name of the Etherow,* it is joined by the Goyt from the south. The stream thus enlarged flows in a north-westerly direction to Stockport; where it receives the river Tame from the north-east. From this place it pursues a winding course, in a westerly direction; dividing Cheshire and Lancashire, and receiving many accessions from both counties, of which the principal are the Bollin from Cheshire, and the Irwell from Lancashire. Passing by Warrington, it soon after extends itself into a broad, shallow channel, which at low water is left almost entirely dry. At Runcorn this channel is suddenly contracted by a projection from the Lancashire side; beyond which it again expands, and receiving the large addition of the Weaver from the interior of Cheshire, it swells into a broad estuary, and taking a north-westerly course, empties itself into the Irish sea below Liverpool.

The tides flow up the Mersey as high as Warrington, where their course is interrupted by a weir thrown across the river. To obviate this impediment to the navigation, and the difficulties arising from the naturally winding course of the stream; an artificial cut of considerable length has been made, which passes to the south of Warrington, and being connected with the Mersey again, at some distance above the town, enables vessels, of sixty or seventy tons burden, to navigate as high up as the place where the Irwell empties itself into this river. The navigation is continued up the Irwell; by which means a water communication is established between Manchester and Liverpool; inferior however in point of commercial convenience to that afforded by the Duke of Bridgewater's canal, for an account of which see the article on *Canals*.

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* This stream in one or two old maps of the county is called the Mersey.

The Dee is a river of considerable importance to Cheshire, though the principal part of its course is in the neighbouring principality of Wales. It visits the western border of the county, forming, for a few miles, the line of boundary between Cheshire and Denbighshire; then crossing over to the city of Chester, it spreads out, a few miles below, into a broad estuary, dividing the hundred of Wirrall from Flintshire. This estuary, from the small proportion which the body of water brought down bears to the breadth of the channel, is left almost entirely dry when the tide is out; presenting to the eye of the spectator, a bed of sand, covering several thousand acres. These sands were, however, at a former period much more extensive than they are at present. By means of embankments a large tract of land has been gained from the sea; while an artificial channel formed for the river affords sufficient depth of water to bring vessels, of between three and four hundred tons, up to the quays at Chester. The navigation is partially interrupted at Chester bridge by a stone causeway, which makes a fall in the river of thirteen feet. The spring tides however flow over the causeway, and allow a navigation for small barges as high up as the village of Bangor, in the detached part of Flintshire, nearly 20 miles above Chester.

From the facility of communication with the port of Liverpool afforded by the Weaver, this river constitutes a most important object in the political economy of Cheshire. It rises in the southern part of the county, near the Shropshire border; flows for a few miles to the south-east; and then holding a course directly north, runs by Namptwich to Winsford. From this place it is made navigable for vessels of nearly 100 tons burthen. Pursuing its course to the north, it reaches Northwich; where, taking a north-westerly direction, it passes by Anderton and Frodsham; and empties itself into the Mersey a mile or two below the latter place. From Northwich to Frodsham the course of the stream is very winding, making the distance by water nearly double that on land.*

At Northwich the Weaver is joined by the Dane, which has its origin on the hills dividing Cheshire from Derbyshire; and which, taking a westerly direction, flows by Congleton and Middlewich. Just below Middlewich, the Wheelock falls into the Dane. This stream rises near Lawton, on the borders of Staffordshire; and flows past the small, but increasing village of Wheelock to Middlewich.

The Bollin is next to the Weaver the largest river in the middle of Cheshire. It rises in the high ground to the south of Macclesfield; and passing that town, pursues a north-westerly course to the Mersey, which it joins below Warburton.

These rivers, which are the most considerable in

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* For a particular account of the Weaver navigation, see the section on *Canals*.

Cheshire, receive all the smaller rivulets and streams in the county. They are very frequently, in rainy seasons, swelled to a considerable size by a surplus of water, which the soil, lying chiefly upon clay, refuses to imbibe. By these means the meadows situated in the valleys, possessing in general but a small elevation above the ordinary level of the water, are subject to frequent overflowings, often to a considerable extent.*

Besides these streams, we have in Cheshire a number of small lakes, both natural and artificial, many of them of considerable extent and depth. The natural lakes are called Meres or Meers, an appellation probably derived from the French *Mer*. The principal of these are Rosthern Mere, Budworth Mere, Mere Mere, Tatton Mere, Pickmere Mere, all in Bucklow hundred; Comber Mere, in Namptwich hundred; Oak Mere on Delamere forest; and Reed's Mere in Macclesfield hundred. Comber Mere, Rosthern Mere, and Budworth Mere, are the most considerable in point of extent. The first of these is nearly two miles in length, and half a mile in breadth; the latter are smaller. All these Meres abound with fish, chiefly pike, bream, perch, dace, and eels. If to these natural lakes be added the artificial pieces of water, of which there are several extensive ones in the county; and the numerous marl pits which are to be met with in every farm; it may perhaps be stated as a fact, that a greater surface of land is covered with water in Cheshire, than in any other county in England, Cumberland and Westmoreland only excepted. The value of the land destroyed in making marl pits was formerly much less considered, than it is at present; and it appears highly probable that the draining, or filling up of many of them, would be a measure extremely profitable to the proprietors on whose ground they are situated.

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* All the water which falls on, or flows through Cheshire, finds its way into the sea by following the channels of either the Dee, the Weaver, or the Mersey. Every other river in the county is tributary to the one or the other of these streams, and they may be said to mark out the divisions of the county into three distinct vales or plains.

A mountainous tract, including Delamere-forest, Beeston-castle, the Peckforton hills, and the high land near Malpas, separates the most western from the central plain; and this last is separated from the low grounds bordering the Mersey and the Bollin, by a range of elevated banks, extending from Macclesfield to Alderley-Edge, and from thence through the townships of Marthall, Ollerton, Knutsford, Tabley, High-Legh, Appleton, Stretton, Daresbury, Halton, and as far as Runcorn. A great part of each of these plains must have been, at some period, lower than the sea; the channels through which the rivers flow having obviously been raised to their present level, from a great depth, by alluvies, or the successive accumulation of loose substances. All the water which falls into the Weaver joins it before it reaches the township of Anderton; and has there to pass through a very narrow channel. The effect of a great flood is, in consequence, tremendous. If this channel could be supposed, at any remote period, to have been obstructed, the centre of the county must have exhibited the appearance of an immense lake; for there is no opening through which the water could have escaped into either of the lateral plains, until it had reached a very great height. As the depositions and strata in the centre of the county have many peculiarities, the possibility of such an occurrence is worth attending to. J.T. S.

CHAP.

CHAP. II.

STATE OF PROPERTY.

SECT. I.—ESTATES AND THEIR MANAGEMENT.

THERE are few counties of equal extent with Cheshire, in which the number of wealthy land-owners seems so considerable. Whether the revenue derived from the soil is in itself greater, or that men of fortune reside more on their estates in this county than in others, may be a question; but from various accounts which I have received, it appears that not less than fifty noblemen and gentlemen are now resident in Cheshire, in possession of property within it of from 3 to 10,000£. a year; and that there are at least as many others with properties of from 1 to 3,000£. a year. At the same time the number of smaller land-owners is not apparently less than in other counties. The description of this latter class has however been very much altered of late years. From the advantages which have been derived from trade; and from the effects of the increase of taxes, which have prevented a man living with the same degree of comfort on the same portion of land he could formerly; many of the old owners have been induced to sell their estates; and new proprietors have spread themselves over the county, very different in their habits and prejudices. It may be doubtful whether the change on the whole has been disadvantageous. Land, when transferred, is generally improved by its new possessor. With a new, and often a more enlightened view of its advantages and resources, he brings with him the means and the disposition to try experiments, and give to his new acquisition its greatest value. He feels the want of comforts and conveniences, which custom had rendered familiar to a former occupier; he builds, drains, and plants; and by his spirit and example stimulates all around him to increased exertions.*

There does not appear to be any peculiarity in the management of the estates in Cheshire. Some gentlemen of fortune, who are fond of agricultural pursuits (and I am happy to state that the number of these seems to be increasing) not only farm to a considerable extent themselves, but take an interest and pleasure in the management of their estates, and in every object conducive to their improved cultivation. Other gentlemen employ as their stewards either attornies, or respectable yeomen who are conversant in the value and management of land.

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* The loss of the old English yeoman will nevertheless be regretted: his attachment to his home, and to the laws and religion of the country; his submission to government; his respect for all who were above him, and affection for all who were below him, rendered him a most useful and valuable member of the community. He was a man contented with his situation, and anxious for the solid and permanent prosperity of the land in which he had been born and educated. He honoured antiquity of possession from principle, because he connected the permanence of families with the real welfare of the state; he encouraged the sentiment from prejudice, because it conferred honour on himself. He had his own pride of birth; and the property he had derived from ancestors he wished to leave unimpaired to posterity. But his pride never was, nor could be, offensive to the poor. He was too little raised above them for their envy: and they had always seen and known him what he was. He had been brought up amongst them, and on all occasions took part in their concerns. He was the link which connected the gentleman and the farmer; and as both were willing and desirous of associating with him on friendly terms, his existence gave a concord and harmony to society; created a common knowledge and interest in all that was passing; and blended into one whole the welfare of each respective neighbourhood. J. T. S.

SECT. II.—TENURES.

"The tenure in this county is almost universally freehold. There are some few copyholds, or what may be called customary freeholds, paying fines, and rents certain, in Macclesfield, Halton, and one or two other manors."*

For any thing further on this subject, see the article on *Leases*.

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* Original Report.

CHAP. III.

BUILDINGS.

SECT. I.—HOUSES OF PROPRIETORS.

THERE are many noble and well-built mansions in Cheshire; but to enter into an enumeration or description of them, would, as I conceive, be foreign to the object of the report. It may be sufficient to state that the county-hall, and the edifice lately built at Eaton by Lord Grosvenor, may alone entitle the county to vie, in the magnificence of its architecture, with any other in the kingdom.

Many houses in the county which, a century or two ago, were inhabited by large landed proprietors, are now either fallen into a state of decay, or become the habitations of farming tenants. Their place is supplied by houses of more modern erection.

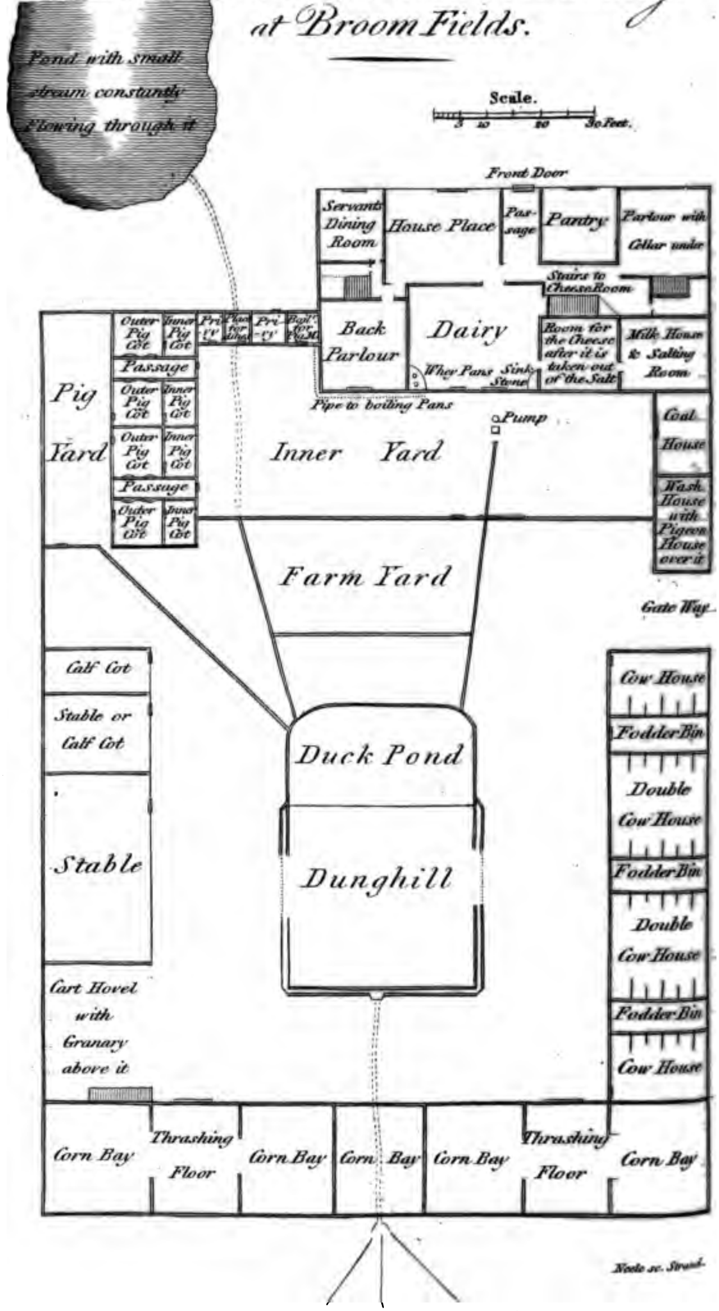
SECT. II.—FARM-BUILDINGS.

THE state of the farm-houses and buildings attached to them, is very various in Cheshire. On some of the large dairy farms in the middle of the county, the buildings, in point of extent, and convenience of arrangement, are equal to those in most parts of the kingdom. In the hundred of Wirrall, the reverse is

unpobtedly

Plate V. P. 83.

Mr. Beckett's Farm House & Buildings at Broom Fields.



Neele sc. Strand.

undoubtedly the case. Here, the farm-houses and buildings are all crowded together into villages, without any regard to the advantages of situation, or to regularity of construction. By this means the farmer is frequently thrown to the distance of two or three miles from his land, a circumstance productive of so many serious inconveniences, as to render the removal of its cause a measure highly desirable.

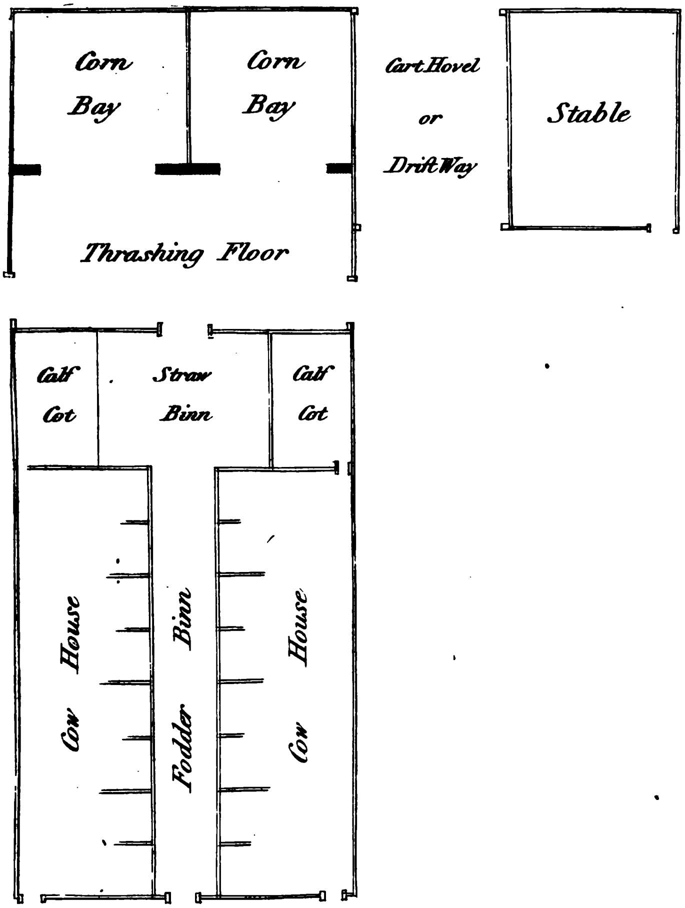
The greater number of modern farm-houses in Cheshire are built of brick and slated; those of older date are usually constructed of timber, framed, and the spaces filled up with brick; others, only of hazels twisted, and coated with clay. The covering of the old buildings is generally of thatch; and here it may be noticed that the dairy-maids usually give the preference to the thatched cow-houses, from their preserving a more uniform temperature than those covered with slate, or tiles. Upon the whole, a very considerable improvement has certainly taken place, in the state of the farm-buildings in Cheshire, within the last twenty or thirty years; and a still further amendment in this respect may be looked for from the increasing spirit of improvement among the land-owners in this district.

The annexed is the plan of an excellent set of farm-buildings at Broomfields, near Warrington, the property of Sir Peter Warburton, Bart. The buildings are of stone, which was procured from a neighbouring quarry, and are all slated. A gentle descent from the ground at the front of the house has afforded Mr. Beckett, the occupier of this farm, the opportunity of conveying a small stream through the farm yard, with which he irrigates the meadows below the buildings. The superior richness of vegetation in these meadows, furnishes abundant proof of the advantage which Mr. Beckett derives from availing himself of this assistance. Since the original erection of these buildings, Mr. Beckett has added to his dairy, and lessened the extent of his tillage; in consequence of which he has found it more convenient to convert the centre corn-bay into a cow-house. I have to express my obligations to him for his kindness in furnishing me with the annexed plan.

I have met with a set of farm-buildings in Ollerton, near Knutsford, which are upon a small scale, but appear to be remarkable for convenience. The general plan of them is in the form of an L. The longer portion of the building, being the width of 30 feet within, admits of two cow-houses of the width of 11½ feet each, and a fodder-bin of 5½ feet between them. At one end of each cow-house is a calf-cot; and at the end of the fodder-bin a small straw-bay, which communicates with the barn-floor. Over the calf-cots and straw-bay, is a corn-bay; and over the cow-houses, a hay-bay. The barn-floor extends the width of the building in length, and is 14 feet in width. Beyond it are two good-sized corn-bays, divided across lengthwise of the building. In the shorter portion of the building is a gate-way, which serves as a cart-hovel, or occasionally to allow a load of corn or hay to be drawn under cover; which may be unloaded through pitch-holes either into the corn-bay, or into the hay-loft above the stable which adjoins it on the other side. The present stable is calculated for four horses; and the cow-houses for eight cows each: but, by extending the building in length, greater accommodation might, if it was necessary, be afforded. The whole is substantially

Plate VI. P. 84.

FARM BUILDINGS in OLLERTON.



Scale $\frac{1}{13}$ of an Inch to the Foot.

Neele sculp. Strand.

stantially built of brick and slate. The annexed plan will give a pretty accurate idea of the building.

The following communication has been made to me on the nature and extent of the buildings required for a farm of 60 or 70 acres in Cheshire.

1. A house of two stories. On the ground floor there should be the house place, or chief dwelling room of the family; a back kitchen, where large pans should be fixed for boiling the whey and the potatoes used for the pigs and cattle; which room should be large enough for the cheese to be made in it, that the house place may be always clean and comfortable. There should be also a buttery on the ground floor; and a salting room, where the cheese press should stand, and where the cheeses may be steeped in brine, and kept until they are fit for removal into the cheese-room.

Above stairs, over the house place, should be the cheese-room: and the remaining part of the floor divided into bed rooms.

2. An oven house may be either attached to the dwelling house, and open into the back kitchen; or be built separate.

3. A stable with four stalls, and loft over it.

4. Cow houses for 16 cows, or young beasts, with lofts above.

5. A barn.

6. A cart-house, with granary above it.

7. A pig-sty, with a hen-roost over it.

SECT. III.—COTTAGES.

THE cottages in Cheshire, generally speaking, cannot be considered as inferior in point of comfort to those of the neighbouring counties; and a gradual improvement in this respect appears at present to be taking place. Those of modern erection are usually built of brick, and covered with slate, or neatly thatched, furnishing a comfortable habitation to the farming labourer; some of older date are constructed of timber and bricks; or of timbers, and twisted hazels, covered with clay; while others again are formed merely of rough stones compacted with mud or clay. The greater number have thatch for their roof.*

The rent of cottages is, of course, much varied by their size, situation, and the conveniences attached to them. Where there is land sufficient for the keep of a cow, it is generally 7, 8, or £9 per annum; when a garden only is annexed, they usually let for 4 or £5 per annum. The rents have, however, been very greatly increased within the last ten years; a natural consequence of the general increase which has taken place in the price of labour, throughout the country.

The cottages for farming labourers are generally situated in the wide part of lanes, or on the borders of commons, where the occupier has the liberty of turning abroad his geese, and his pigs; or a small cow, where his circumstances will permit, and his allotment of ground produces a sufficiency of winter food. This is one of the circumstances which produces opposition to the enclosure of commons and waste lands. Such enclosures are, however, prevented much more by the existing law, which gives a settlement in the township to the tenant who rents 10 *l.* per annum. The following excellent remarks on this subject were communicated by J. T. Stanley, Esq.

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* It may be doubted, whether the substitution of slate for thatch, in cottages and small farm-houses, is an advantage. Thatch renders a house warmer in winter, and cooler in summer, than slate. In winter, it prevents the warmth produced by the fires from escaping; and in summer it absorbs few of the sun's rays; at least, it allows but little heat to penetrate through it. A room below thatch may be kept warm with half the fuel which it would be when below slate. All out-buildings, in which warmth is not required, should certainly be slated.

J. T. S.

"The country is absolutely losing population by the operation of the law which gives a settlement to the occupier of ten pounds a year. Nothing can be more absurd than the assertion, that the occupation of lands worth 10 *l.* per annum, supposes a man to have had credit and estimation above the class of people likely to become paupers. As the law is explained, a man may occupy the land in two different counties, and a settlement be gained where he has slept, and where no one would have trusted him with the occupation even of a garden. It enables paupers to be continually throwing themselves upon the townships where they find charitable institutions, or other advantages; in consequence of which, land-owners either pull down their cottages, or let them, without land, to such persons as belong to their townships, to diminish the chance of new rent charges falling on their properties. A good cottage, with land sufficient to keep a cow, is worth eight or nine pounds a year; a person holding such a tenement can therefore at any time gain a settlement where he resides, by renting an acre of aftergrass, and a little potatoe land. The law by this means actually operates against the poor; and many more might have opportunities of renting land sufficient for the keep of a cow, were it not so easy for them to obtain a new settlement by these means. A holding of at least 20*l.* per annum, should be made requisite to confer a settlement, were it for no other purpose than to prevent cottages being let without land; and the land occupied ought to be in the same township where the man resides, and under the same landlord. The alterations in the law need not be applied to towns, if it be thought unwise to encrease the difficulty of obtaining settlements on a general principle; as it now stands, it evidently does mischief in the country, and defeats one great object which the Board of Agriculture has in view, the increase of the number of cottagers holding land."

I find, on looking into the Agricultural Report of Kent, that the practice of attaching a small portion of land to the cottage of the farming labourer is severely deprecated by Mr. Boys, the ingenious author of that report. The reasons which he urges against this practice appear, however, by no means satisfactory. Speaking on this subject, page 35, he says:—"A great many by industry, and a very penurious mode of living, would upon these spots entirely support their families, without any other labour. Hence would the most material part of the husbandry labour be lost to the country, &c." This opinion may surely admit of much doubt. A man cannot, by any industry, obtain subsistence for his family, on two or three acres of land, unless the whole was cultivated as a garden, even with the most penurious mode of living. Under such circumstances, therefore, he is necessitated to seek for some additional employment; he engages himself out as a day-labourer, and spends his leisure time in cultivating the ground attached to his cottage; by which means, his family is supported in a situation greatly more comfortable than they could otherwise have enjoyed, and a quantity of labour is gained, rather than lost, to the community. Mr. Boys indeed asserts, that the attachment of two or three acres of land, to the cottage of the farming labourer, would induce him to run about the country, retailing small articles of the produce, and idling away much of his time in public houses and gin shops. But these assertions appear to be by no means well founded. Admitting that there is a small portion of surplus produce after the demands of a family are supplied, (and small indeed it must be from two or three acres of land), are the consequences to which Mr. Boys alludes, altogether necessary and unavoidable? Does it not, on the contrary, appear probable that the labourer, having the means of employment at home, would be less likely to frequent public houses, and thus to acquire habits of idleness and intemperance? A small spot of ground attached to his cottage would give him this employment, without adding much to the fatigue of his daily labour; while the feeling of independence communicated to his mind by these means, and the consciousness of additional comforts, resulting from such a situation, would, for the most part, operate as an effectual preventative of idleness and dissipation.

Mr. Boys, page 34, says, "The more I consider this subject, and the more experience I have, the more I am convinced, that were it possible to put every cottager in such a situation, the consequences would be ruinous to the community at large." And again, page 35, "I have even the boldness to assert, that I do not believe he would be rendered happier, or richer, by the measure." I have only to observe in answer to these assertions, and the inferences he has drawn from his own experience, that all the intelligent persons in this county, with whom I have conversed on the subject, have expressed a different opinion; and this founded on their own experience. They inform me, they have invariably found, that the attachment of a small portion of land to the cottage of the labourer, has been the direct means of rendering his situation in life more comfortable and easy; and of inducing those habits of honest independence, of temperance, and of industry, which are most efficacious in promoting the happiness of individuals, and consequently the general interests of society.

CHAP. IV.

MODE OF OCCUPATION.

SECT. I.—SIZE OF FARMS.

THE following statement of the size of the farms in four townships, situated in different parts of the county, will perhaps give a clearer view of the subject than could be communicated by detached remarks; it has been drawn up from actual admeasurements of the farms in question.*

HOLDINGS.	No. of each in the first Township.	No. of each in the second Township.	No. of each in the third Township.	No. of each in the fourth Township.	Total of each in all the Townships.	Averaged quantity of Land in each Class of holdings.					
a. a.						a.	r.	p.		a.	r.
Under 1 Acre	3	3	8	9	23	at 0	2	0	each is	11	2
Between 1 and 2	1	10	3	3	17	—1	2	0	——	25	2
2 — 5	11	6	0	2	19	—3	2	0	——	66	2
5 — 10	6	2	2	2	12	—7	2	0	——	90	0
10 — 20	1	0	2	1	4	—15	0	0	——	60	0
20 — 30	1	1	1	0	3	—25	0	0	——	75	0
30 — 40	3	2	3	0	8	—35	0	0	——	280	0
40 — 50	2	4	0	2	8	—45	0	0	——	360	0
50 — 60	1	1	0	1	3	—55	0	0	——	165	0
60 — 70	2	2	1	1	6	—65	0	0	——	390	0
70 — 80	1	2	3	4	10	—75	0	0	——	750	0
80 — 90	1	3	2	2	8	—85	0	0	——	680	0

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* Communicated by Mr. Fenna.

HOLDINGS.	In first Township.	In second Township.	In third Township.	In fourth Township.	Total in all.	Averaged quantity of Land in each Class of Holdings.			
a. a.							a.		a.
Between 90 and 100	1	2	0	0	3	at	95	each is	285
100 — 110	0	1	0	0	1		105	——	105
110 — 120	1	1	0	0	2		115	——	230
120 — 130	1	0	0	0	1		125	——	125
130 — 140	2	2	0	1	5		135	——	675
140 — 150	0	0	2	0	2		145	——	290
150 — 160	1	0	0	0	1		155	——	155
160 — 170	0	0	1	1	2		165	——	330
170 — 180	0	0	0	0	0		——		——
180 — 190	0	0	0	0	0		——		——
190 — 200	0	0	0	0	0		——		——
200 — 240	0	0	0	0	0		——		——
240 — 250	0	1	0	0	1		240	——	240
250 — 300	0	0	0	—	0		——		——
300 — 310	0	0	1	1	1		300	——	300
No. of Holdings -	39	43	28	30	140				
No. of Families -	39	43	28	30	140				
Number of Acres in occupation	1421	1847	1098	1317	5683				
Do. waste or common	35	75	214	8	334				

It may perhaps be desirable to repeat this statement, in such a way that the land held by the cottager and farmer may be more accurately discriminated.

	No. of holdings.	Average quantity of Land in each class of holdings.
The Occupiers of 20 acres, and under, are wholly, or in part, employed by the holders of larger farms as labourers, - - - - - -	75	253 ac. 2 rds.
Farms containing between 20 ac. and 50	19	715
Ditto, ditto, 50 — 100	30	2270
Ditto, ditto, 100 — 150	11	1425
Ditto, ditto, 150 — 200	3	485
Ditto, do. above 200 acres each	2	540
	140	

From this statement it appears that, in the townships in question, the greatest number of holdings, in any of the foregoing classes, are under one acre each; and that the greatest quantity of land is occupied by tenants renting from 50 to 100 acres. An extension of these results to the county at large might probably be made without any great inaccuracy of statement. By calculations, formed with an express view to the ascertainment of this fact, it would appear that the average size of holdings cannot be estimated at more than 70 acres; and, in this statement, all those under 10 acres are excluded. Some few dairy farms in this county run as high as 350 or 400 acres.

The comparative utility of large and small farms is a subject which has excited much attention and discussion in the agricultural world. To myself, I confess, the propositions in favour of large farms seems to have the most weight, and for the following reasons. Twenty or thirty acres of land cannot, in the nature of things, furnish full employment to a farmer; nor is the profit which they afford by any means adequate to the comfortable subsistence of a family: a man, therefore, who enters upon a farm of this description, must either have some other occupation, to which he directs a great share of his attention; or must unavoidably be subjected to poverty, and all its concomitant distresses. In either of these cases, the disposition of the land cannot but be regarded as unfavourable to the general interests of agriculture; in the former, farming being made an object of secondary consideration, and frequently being very imperfectly understood, the cultivation of the land is seldom carried to its practicable length, and consequently a certain proportion of produce is virtually lost to the community: in the latter case, the evils resulting from a farm of this description are still more decided in their nature; since it will be generally admitted, that no species of occupation can be beneficial in its consequences to the country at large, which is not so to the individuals immediately concerned in it. The same reasoning will apply equally to farms of forty or fifty acres: wherever the extent of land is not sufficient to furnish full employment to the farmer, and a comfortable subsistence to his family, a certain portion of personal exertion must necessarily be lost; and the consequences must be unfavourable, whether considered individually, or in a national point of view.

Another serious objection to small farms may be grounded on the difficulties they oppose to general improvements in agriculture. A farmer entering upon 30 or 40 acres, very frequently with a high rent, and little or no capital, cannot be expected to make any material improvement on his land, or to attempt experiments in cultivation which are probably expensive in the first instance, and uncertain in the results they may afford. All that he can do is to pursue the old beaten track; to force out of the ground the payment of his rent, and a bare subsistence for his family; and fortunate may he esteem himself, if he succeeds so far as to do this. On the other hand, the man who farms a considerable extent of land can pursue with vigour any new modes of agriculture, that appear likely to be attended with beneficial effects; the possession of a competent capital enables him to undertake, and put into execution, any improvements of which his farm is susceptible; till by these means his land is brought to the highest state of productive fertility. The opportunity, which is afforded him, of making one department of his farming economy subservient to another, is an additional advantage which the farmer on a small scale cannot carry into effect to any great extent. The latter too must necessarily expend on his land a quantity of capital greater, in proportion, than is required in a farm of more considerable size; he must have his cart and horses, his plough and his harrow, and every other agricultural implement as well as his neighbour, though he has only thirty acres, and his neighbour eighty or a hundred. Reverting then to the well established, and indeed self-evident axiom in political economy, that capital is most advantageously employed, where with a given quantity the largest proportion of produce is the result, it seems scarcely to admit of a doubt, that large farms are, in this point of view, greatly more beneficial to the nation at large, than those of small extent only.

The principal objections to large farms are founded on the tendency, which, it is asserted, they have to diminish the population of the country, and to increase the price of provisions. It is obvious, however, that both these objections cannot stand their ground at the same time. If the population of the country be diminished, while the produce of the ground is encreased, or even while it remains the same in point of quantity, it is clear that no increase in the price of provisions can take place; on the contrary, it would be natural to expect a very considerable reduction in this respect. As these objections against large farms may, however, be urged individually, it is proper that a distinct answer should be given to each of them. With respect to its influence on population, it cannot be denied, that the consolidation of several small farms into one of larger extent might have the immediate effect of throwing a number of individuals out of employ; many of whom, from the inadequate demand for labour of other kinds in the country, would be necessitated to have recourse to emigration. But this effect could be only of temporary duration. If, in consequence of the diminished number and increased size of farms, the improvements in agriculture became more extended, and its general state more flourishing, it can scarcely be doubted but that the ultimate effect in this change in the disposition of the land, must be favourable to the population as well as to the prosperity of the country.* The immediate effects of the adoption of improved modes of cultivation, and of the increased quantity of produce from a given proportion of capital, must be a diminution in the price of provisions. As a necessary consequence of this, the price of labour must likewise be diminished; or, to speak in more general terms, an increased value would be given to the circulating medium; a circumstance highly favourable to a country, as it regards its commercial and manufacturing connections with other nations. The equalizing nature of commerce would indeed, in process of time, restore this value to its accustomed level; but the impulse which had been given, meanwhile, to industry of every kind, could not fail to ensure internal prosperity, and consequently an increase of population to the country. If this reasoning be accurate, there appear no grounds for doubting that the enlargement of farms, to a certain extent at least, would be productive of essential benefit to the real interests of the nation: a trifling diminution in population might perhaps indeed be the immediate result of the measure in question; but that the ultimate consequences of its operations would be injurious in this respect does not appear probable.

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* For a further illustration of this subject, see Lord Selkirk's very ingenious and elegant work, " *On Emigration from the Highlands of Scotland.*"

The objection which has been urged against large farms, as tending to enhance the prices of provisions, seems equally devoid of validity. The grounds of this objection are, that, by the enlargement of farms, the competition which exists among small farmers would be in a great measure lost, and a spirit of monopoly introduced in its stead. In answer to this it may be sufficient to ask the simple question, why may not this competition, esteemed so advantageous to the country, take place among farmers who hold two, three, or four hundred acres of land, as well as among those who hold thirty or forty? That this is contrary to experience I can by no means allow. Wherever monopoly has been the immediate cause of an unusual high price of corn, or other necessaries of life, it must, I conceive, have been practised on a much larger scale than could be done by any combination of farmers in the country. In fact a very slight consideration must prove the futility of any objections to large farms rested on this ground. Supposing, for the sake of argument, that the farmers, in any one county or district, should combine to keep their stocks out of the market, and thus to raise the price of provisions; is it at all consistent with probability to suppose that the farmers, in the neighbouring districts, would favour this scheme by retaining their individual stocks? on the contrary, is it not more likely that they would immediately come forward, to supply the deficiency in the market, and thus counteract the designs of their more avaricious neighbours? Indeed it appears a point so clear that the same competition of interests must exist among large, as well as among small farmers, that, I apprehend, no conclusion can be deduced from this circumstance, which will not apply with equal force to both cases. If then this competition renders provisions cheaper where the farms are small, will it not have precisely the same effect where they are of large extent? and does it not appear highly probable, that a very considerable diminution of the price of provisions would be the consequence of the general enlargements of farms in the kingdom? This, as was stated before, must, in the natural course of things, be the immediate effect of improved modes of cultivation, and of an increased quantity of produce from a certain given expense of capital.

I would not however be understood in the preceding remarks to contend for an indefinite extension of the size of farms. I wish merely to state some of the grounds for supposing that small farms, by which term I understand those from 30 to 60 acres, are, generally speaking, less beneficial to the country than those of a larger size, or of two, three, or four hundred acres.*

I may remark at the same time that in a dairy country, like Cheshire, the objections that have been made to small farms apply with less force than they would to a district where tillage was the principal object of attention. On a dairy farm there are many little articles of indirect profit, such as curds, whey, buttermilk, &c. all which it is evident contribute greatly to the subsistence of a family, and enable a man to live more comfortably on a farm of small extent, than he could do independently of these little supplies. I must remark too, that, while defending large farms, I would not be understood to urge any objections against the attachment of a small portion of land to the cottage of the labourer; a practice evidently beneficial in itself, and which would probably be more widely adopted, if the fear of conferring a settlement by a rent of £10. a year did not prevent it. The effect of it is, to procure a more certain and comfortable subsistence for the family of the labourer; and to communicate, in general, a spirit of honest independence, which cannot be too much cherished among the lower classes of society.*

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* Notwithstanding what I have urged in favour of large farms, I am fully aware that many very powerful arguments may, and have been brought forward on the opposite side of the question; and that, after all, it must probably remain one of mere theory, incapable of being reduced to a fair trial by a general practice. Granting even, what I have been contending for, that an increase of produce would be the consequence of land being let out in large allotments; there are many who would be disposed to doubt whether the diminution of the class of farmers; the loss of gradation in the scale of farms; and the lessened competition would not be evils which would more than counterbalance this advantage.

Character of Farmers.—It is somewhat difficult to form an accurate estimate of the character of a body of men, where so much variety arises from individual circumstances and situation. In Cheshire (and perhaps the distinction may without error be extended to the whole kingdom) the large, and small farmer are, generally speaking, completely different characters; different in their habits, and different in their ideas. The education and opinions of the latter class are for the most part exceedingly narrow and confined; a circumstance naturally resulting from their situation in life, which will not allow of much time and attention being devoted to general improvement. A farmer of this description will with difficulty admit the slightest innovation upon the mode of agriculture to which he has been accustomed: insensible to the benefit which might probably result from the proposed alteration, the practice which he has received from his forefathers, he is too apt to transmit, unaltered, and unimproved to his posterity; his habits have been formed to one particular system, which he continues to pursue with a blind and undeviating attachment. Such is too generally the character of those who hold small farms in Cheshire: but it gives me great pleasure to state, on the other hand, that there are among the larger farmers in this county, a set of men, who for their general intelligence and respectability of character, and from the judicious and rational spirit of improvement by which they are animated, may deservedly rank among the first agriculturists in the country. To the exertions and influence of this truly valuable body of men may be attributed, in a great measure, the very considerable improvements which have of late years taken place within the county. They have at the same time contributed materially to the diffusion of that spirit of investigation and experiment, which, regulated by judgment, cannot fail of leading to other improvements equally important and beneficial.

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* See the article *Cottages*.

I must not dismiss this subject without devoting a few words to the fair dairy women in this county, of whom indeed it is impossible to speak but in terms of approbation. The farmer has only to provide a proper stock of cattle, and to superintend the management of his white and green crops;

he is secure of having his rent made up for his landlord, by the industry and excellent management of the female presiding in the dairy, who is usually his wife, daughter, or some other person connected with the family. To the same source too may be attributed the general appearance of neatness and comfort which is observable in the domestic economy of the dairy farmer; a circumstance of no trivial moment, when considered in its reference to the character, as well as to the happiness of an important and useful class of society.

SECT. II.—RENTS.

In few parts of the kingdom is the average rent of land higher than in Cheshire. This circumstance, though it cannot be attributed to any peculiar richness of soil, may perhaps be accounted for by a reference to a few facts connected with the agricultural economy of the county. In the dairy districts, the high price of cheese and butter keeps up the price of land; and the great expense of erecting, and preserving in proper repair, the large extent of buildings which is necessary on a dairy farm, gives the landlord a right to expect from his tenant a higher rent than might otherwise be reasonable. Besides, the dairy farmer, as was mentioned in the last section, derives several small indirect profits from his farm; which, by contributing greatly to the subsistence of his family, enables him to pay a higher rent than a farmer of another description, on the same quantity of land, would be able to do. Other circumstances may have conduced to the effect in question: such as the general smallness of farms; the introduction and rapid increase of manufactures in this part of the kingdom; and the proximity of the county to the large markets of Manchester and Liverpool. The two last circumstances particularly have operated essentially in raising the rent of land. The prodigious increase of population, which has taken place within the last thirty years in the southern part of Lancashire, has called for a proportionally increased supply of provisions from the whole of the neighbouring county; while the great facility of internal communication by artificial canals enables the farmer to convey his produce to market at a cheap rate, and with the same expedition as by land-carriage.

In consequence of the combined operation of these circumstances, the rents in Cheshire probably average not less than 30*s*. per statute acre. In the immediate neighbourhood of towns they of course run much higher; land in that situation being frequently let at six, seven, or even eight pounds per acre. In the manufacturing districts also, rents are, in general, considerably higher than the average that has been stated for the whole county; the manufacturer paying a greater price for the land which he holds, than the farmer is either willing, or able to do. Some land particularly favourable for the purposes of the dairy is let as high as 50 or 55*s*. per acre; which I find to be the case on a few farms in the middle, and southern parts of the county; but it is a circumstance of very rare occurrence. Taking then the average rent at 30*s*. per acre, and making a proper allowance for waste lands, the total annual rental of the county may, perhaps without any material error, be estimated at £900,000; a sum a sum which bears a much higher proportion to the extent of surface, than is generally the case throughout the kingdom.

The ancient custom of paying rents in kind is now almost entirely abolished. On some dairy farms the landlord, by a covenant in his lease, has the liberty of choosing a cheese at Christmas; in other instances he receives a goose or a couple of fowls. Personal services on the part of the tenant are now seldom required; it being found in general more convenient for both parties that the rent should be paid entirely in money: in some cases, however, the landlord requires from his tenant a few days team work every year; or, where no team is kept, two days harvest work as a labourer.

SECT. III.—TITHES.

THE question respecting the policy of tithes has been made the ground of so much discussion, both by indifferent persons, and by those who have an immediate interest in their operation, that I esteem it perfectly unnecessary to extend this article by entering into any investigation of the subject. That tithes do oppose a very material hindrance to agricultural improvement must be allowed by every unprejudiced person; whether any mode of commutation could be devised which would in a great measure remove this evil, and at the same time give entire satisfaction to both the parties concerned, is a question about which there may exist a considerable degree of doubt.

The quantity of land exempt from the collection of tithes is very inconsiderable in Cheshire. On the College lands, which are extensive in this county, they are all held by lay proprietors; chiefly on leases of twenty-one years, renewable at the end of every seven years. These proprietors usually collect a portion of their tithes in kind, and let out the remainder; or, as is the case in many instances, make an annual composition with the farmer, sending a person to value the produce of the corn land, and allowing the farmer the option of taking or refusing the titheable portion, at the valuation that is made. A similar plan is almost invariably pursued when the tithes are in the immediate possession of the clergy.* In many places the hay is valued in the same manner; but, in general, a trifling modus is paid in lieu of tithes on this article of produce. In some parishes it is tithed in kind.

A variation occurs in almost every parish with respect to the articles tithed, and the mode of tithing them. In some parishes a tenth part of the produce is collected; in others only an eleventh. In the former case, however, there is seldom any tithe on hay; which contributes in some measure to restore the equality. Turnips and potatoes are not often tithed, except when grown in large quantities for the markets. Vetches and buck-wheat are likewise exempt when got in an unripe state for fodder, or ploughed under for the improvement of the soil.

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* The method of letting off the tithes to the farmer for a year, or a term of years, is now much more frequent in the county than formerly, and will in all probability be still further extended, as in general, it appears to give greater satisfaction to the farmer to retain his produce, even at its highest value, than to have it rented and carried off by strangers. *Mr. Fenna.*

SECT. IV.—POOR RATES.

Few subjects connected with the political economy of the country appear to be so deserving the active investigation of the legislature, as the system of laws which regards the poor. Whether the operation of these laws has been such as their original institutors designed; whether they have tended to ameliorate the condition of the lower classes in society, and to promote the general internal prosperity of the country; or whether their effects have been the reverse of these; are questions highly interesting in a national point of view. From the great increase which has, of late years, taken place in the number of the poor throughout the kingdom, there certainly seems too much reason to believe, that the measures which this system involves are, to say the least of them, incompetent to the ends in view; and that there exists a necessity for adopting, and pursuing with vigour, others more efficient and salutary. Whatever may be the advantages derived from the existing laws, the positive evils which they produce are but too apparent. They have a direct tendency to annihilate the spirit of honest independence amongst the lower classes of the community; to take from them the strongest stimulus to industry; and by affording a refuge to the idle, the profligate, and the abandoned, to contribute greatly to the extension of every species of vice and immorality.

That some provision must be made in every community for the aged and infirm among the lower classes, is a position concerning which no doubts can possibly be entertained. This provision the poor laws in England certainly do make; but by a mode of operation, according to the opinion of many intelligent individuals, defective in so many respects, as to render an alteration of the system a measure sincerely to be desired by every person who wishes well to the interests of his country."

I cannot better enforce these remarks, than by inserting the following communication, with which I have been favoured by a most active and intelligent magistrate, whose situation has afforded him every opportunity of making observations on the subject.*

"The poor rates will in a short time alter the whole character of the English nation: they promote an enmity between the land occupiers and the poor, which makes every township a scene of warfare. The poor, and particularly the wicked and idle, demand dwellings, cloathing, fire, and a weekly pension as their right; and by insolent importunity obtain them. The industrious honest labourer cannot be said to have one advantage in point of comfort over the man who lives in the alehouse, and suffers his children to run wild over the commons. The overseer must relieve all who have wants; and the magistrate, should he hesitate, must order him to do so. The facility of being maintained destroys every stimulant to exertion; and honesty having no advantage, the rogue laughs at the honest man. Debauchery, drunkenness, petty thefts, and perjury, are increasing with rapid strides; and the expense of prosecutions leaves the common people in the secure enjoyment of their licentiousness. The wicked, from their numbers, are absolutely become powerful; no magistrate can now attempt to put in force any of the old laws respecting small offences. The pillory, the stocks, and all means of inflicting moderate punishment are laid aside; and imprisonment in the public jails alone is resorted to, which always adds to the depravity of the offender.

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* J. T. Stanley, Esq.

"If there was an earnest desire in the legislature to remedy the evil, many modes might be pointed out; but no half measures would do any good. The evil is of the greatest magnitude, and every day renders its cure more difficult; because the number of those who would suffer by a vigorous law affecting the idle, is increasing. Whatever the law is, it should be imperious; and the overseers should be allowed no choice in the distribution of their charities. They should be compelled to find work for the idle, and not suffered to give them money. For the maimed and the sick there should be public hospitals. There should be punishment for the depraved; and magistrates and constables should be armed with a power that could reach petty offences. No woman ought to have a right to call on the public for the maintenance of an illegitimate child, without suffering some punishment for her misconduct. More should be left to private charity than is at present. Indeed, who now will give money to relieve distress, which, if charity does not, the law must relieve? Charity now only goes in aid of the poor rate; and whoever maintains a poor labourer or sick widow, exempts his neighbours from a portion of their tax."

Nothing peculiar can be stated with respect to the poor rates in this county. They have of course risen rapidly in amount within the last few years; in common with those in every other part of the kingdom. The average for the county may perhaps be stated at two shillings in the pound, at a full valuation. Colonel Ford informs me, that in the township of Sandbach the poor rates considerably exceed this average; a circumstance which he regards as the effect of some funds belonging to the poor in that township. These induce a greater number of individuals to gain settlements in this township than would otherwise be the case; and as the money is generally spent as soon as distributed, a more burdensome amount of poor rates is of necessity entailed on the other inhabitants of the township.*

SECT. V.—LEASES.

THE practice of leasing for lives, which was formerly very general in Cheshire, is now by no means so frequent. Most of the old leases of this description have now run out, and only a few of the land proprietors in the county retain the custom on their estates. Neither are leases of twenty-one, or fourteen years, by any means so frequent as formerly; few terms now given exceeding eleven years, and the generality not rising above seven; a circumstance which may be attributed to the operation of several causes, but principally, perhaps, to the rapid decrease in the value of the circulating medium. When leases of twenty-one years are given, it is generally under a condition that the tenant should incur some extraordinary expenses at the commencement of his term; or where the land is so rough, that it cannot soon be brought into a state of profitable cultivation. An exception must be made for the Church and College lands, which are all held either for the term of twenty-one years, renewable at the end of every seven years; or on leases for lives.

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* A judgment is generally formed of the number of poor and their distress, in any given district, by the sum stated to be paid in the pound for their relief: but there may be great fallacy in the conclusions drawn from such data. Where the rents of land and of houses are high, a greater number of poor may be maintained by a small rate made in the pound; than a lesser number, in a place where the rents are low, by a heavier rate. Land in a very extensive area may be let only for ten shillings an acre; and in a smaller area for three pounds; and the population, on the larger area, will probably be the greater. Thus in a parish in one county the rate may be ten shillings in the pound, and in a parish in another county only two shillings; and yet the number of poor in both parishes relieved be the same.

"The covenants between landlord and tenant are various and uncertain. The following are some of the most general clauses:—the tenant agrees to pay his rent half yearly; to pay all levies and taxes whatsoever; perform statute duty in the highways; carry any materials that may be wanted for the repair of his buildings, &c.; to keep the buildings, fences, &c. in good, sufficient tenantable repair, being allowed timber, and other necessary materials in the rough, for that purpose. The tenant is confined to a certain quantity of tillage, usually about one-fourth of his farm, exclusive of meadow and summer fallow; he is restrained from ploughing any of the land more than three, or at most four years, in one course of tillage; and covenants to lay the land down, in a husband-like manner, with clover and grass seeds. He is also restrained, in some instances, from sowing brush wheat, and from setting more potatoes than are necessary for the use of the family; and is not to let or assign any part of the premises without the consent of his landlord. He is frequently restrained from paring and burning.* In some instances he agrees to lime, or marl annually a certain number of acres; and to lay his dung on the pasture land. This last clause has been lately introduced, and seems likely to become more general. The injury done to land, by suffering weeds to run to seed, is guarded against in some leases, by the landlord's reserving to himself the power of cutting them down at the tenant's expense, if he shall neglect to do it after being called upon." †

This seems to be an accurate account of the clauses usually introduced into leases in this county. It may be mentioned likewise, that an entire reservation is made to the landlord of all the timber, growing upon the farm; the tenant being restrained from cutting or lopping the trees for his own use; and being bound by the terms of his agreement to preserve them from all injury whatsoever. The game, and all minerals that may be discovered on the farm, are likewise reserved to the landlord.

The usual time of entry upon a farm is at Candlemas, the off-going tenant being allowed the use of the buildings, and of a pasture field near the house as an outlet for his cattle, until the 1st. of May, old stile; he is also entitled, by the custom of the county, to two-thirds, or, in a few instances, to three-fourths of the fallow wheat, and generally by agreement to half the eddish or brush wheat which may be growing on the premises at the time of his quitting. ‡

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* Paring and Burning, even though not specially provided against in a lease, is actionable by the common law of the land, as tending to exhaust the staple of the soil wherever it is practised.

† Original Report.

‡ In the original Report of Cheshire, I find it stated, that the off-

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Several land proprietors have of late years adopted the practice of forming a new agreement with a tenant two or three years before the expiration of the old term; the rent continuing the same until the actual commencement of the new lease. This plan seems obviously advantageous to both parties. The tenant is led to pursue with spirit and vigour many improvements which he might have felt unwilling to enter upon, had there been any uncertainty as to the future occupation of his farm; while a stop is put to that most prejudicial custom of working the land as hard as possible towards the expiration of a lease, or, as it is called, *getting the land in readiness for the landlord.* Whatever ensures, or contributes to promote, the community of interests betwixt landlord and tenant, cannot be otherwise than generally beneficial.

SECT. VI.—EXPENSES AND PROFITS.

NOTHING is more difficult than to ascertain with any degree of accuracy the actual expenses and profits attendant upon farming. So many circumstances are occurring to vary these on different farms; so few farmers are in the habit of keeping accounts, sufficiently regular for the formation of such calculations; and of those who keep accounts, so few are willing to communicate any information relative to their individual expenses and profits; that it becomes almost a

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going tenant is entitled by the custom of the county to three-fourths of the fallow wheat. Here however Mr. Wedge is not strictly accurate; two-thirds, and not three-fourths, being the quantity generally allowed throughout the county.

matter of impossibility to procure statements which can convey any accurate ideas on the subject. These difficulties I have experienced, to their full extent, in endeavouring to obtain the information necessary to the drawing up this article. Readily conceiving that nothing could be procured by applications for the account of expenses and profits on particular farms; I stated my queries in a more general way, requesting information as to the probable expenses and profits on a dairy farm of 200 acres, without reference to any individual instance. Finding however that this mode of application was equally unsuccessful, I was induced at length to relinquish the design; and must plead as my apology for the omission of this part of the plan prescribed by the Board, the causes before mentioned. It cannot be reasonably expected that the farmer who rents his land should consent to have a statement of his profits brought forward, in a way which would naturally attract the attention of his landlord, and might have an effect in raising the rent of his farm; while among those farming their own land, there are few who note down, with sufficient accuracy for the purposes of such a statement, all the incidental expenses which they incur; and which, though small when taken individually, rise in conjunction to a very considerable amount. Even were one or two calculations of this kind obtained, the information communicated by this means would, I apprehend, be very trifling, and perhaps only accurate with respect to the farms from which they were respectively obtained; so great is the variety resulting from circumstances of a local and individual nature.

I may remark, in general, that as cheese is the principal object on the greater number of Cheshire farms, all farming expenses are to be set in opposition to the profits arising from this article of produce; rent; interest of the money sunk in stock; losses of live stock, which may probably average nearly ten per cent. on the rent; labour out of doors, and in the dairy; wear and tear of implements; fuel; salt, &c. In addition to these expenses the interest of one year's rent, at least, is sunk during the time of making and getting the cheese to market. When these circumstances are considered, in connection with the high rent of land in this county, and the large sum necessary to stock and furnish a dairy farm, it will be evident that the receipts of the Cheshire dairy farmer must be very considerable to counterbalance the concomitant expenses. What is the actual amount of the profits on a farm of this description, I have not the means of ascertaining; nor is it possible, from the causes mentioned before, that a reference to one or two particular instances should serve as an accurate criterion, on this point, for the generality of farms in the county. There seems reason to believe, however, that the greater number of dairy farmers must make fifteen per cent. on their capital; many of them, in all probability, considerably more.

CHAP. V.

IMPLEMENTS.

NOTHING very peculiar can be stated with respect to the farming implements usually employed in this county. Of the various kinds of ploughs, that most commonly used is the Rotheram or Yorkshire plough. The double plough with wheels has been employed in some instances, and with great advantage. The mole-plough for draining clay lands has been introduced on several farms; and, from the high and deserved estimation in which it is held by the farmers who have already adopted it, its use will, in all probability, become more general in the county. The harrows used are of various kinds; a drag for summer fallows, and large and small double harrows. On stiff clay land which could not be sufficiently broken down by the harrow, or for reducing marl, the spike-roller is frequently employed, and with great success. Rollers with knives are likewise used for cutting soddy, or tough fallows; and small light ones for levelling the surface of land when sown. Iron rollers have been introduced in several instances; generally however they are constructed of wood, and made heavier by a cart-chest at the top, filled with a greater or smaller number of stones, as circumstances may require: this chest serves also the purpose of holding the stones picked up by the lad following the roller. The cultivator is used in many instances for clearing fallows, and with the greatest advantage.

On farms where the drill husbandry is practised, the usual drill implements are employed for this purpose. Where turnips are sown, Knight's drill barrow is very frequently used; in some instances, the Northumberland drill implement is employed for this purpose. The use of the thrashing machine seems to be increasing in Cheshire; though not with so much rapidity as in many other counties, where tillage is a more principal object of attention. It has been adopted on several large dairy farms, and as far as I have been able to ascertain by enquiries upon the subject, with the most decided advantage to the farmer. Independently indeed of any minute calculations with a view to the ascertainment of the fact, it appears clear that the use of the thrashing machine must be productive of a very great saving of expense, on every farm of considerable extent. Such calculations have been made; but from the constant variations which occur in the prices of labour, at different times and in different districts, no result that is generally applicable can be obtained. Individual circumstances and calculations must be the grounds on which the farmer rests, in the erection of a thrashing machine; and an attention to these will generally enable him to ascertain, with tolerable accuracy, how far the scheme will be profitable, or the reverse. The thrashing machines which I have seen in this county have been, for the most part, of a small size, but conveniently fitted up. Those belonging to Henry Tomkinson, Esq. of Dorfold, and to Mr. Thomas Remer of Hill-Top, near Warmingham, are remarkable for the neatness of their construction, and their excellent adaptation to the buildings connected with them.

On the roads, and in drawing home the harvest, waggons with wheels, six and three inches broad, or long carts with wheels of the same width, are usually employed. The dung carts have, generally, wheels six inches broad; for marl, small carts are employed. On wet grounds, a sledge is occasionally used for the conveyance of thorns, &c.

The implements employed in the hay and corn harvest, and in the barn, are the same in Cheshire, as in the generality of other counties, and do not merit individual notice. It will be necessary, however, to mention more particularly the *hodding scythe*, an implement which is not so well known, but which has been used to a considerable extent in some parts of this county, in clearing land from rushes; and the effects of which appear to have been extremely beneficial. "Since this method of eradicating rushes has been known, many scores of acres of low and marshy meadow lands have been cleared; and with the aid of gutters, more than doubled in their value. The implement is nothing more than a short, strong scythe. The blade is about twenty inches in length, but curves in a different way to the common scythe; the edge is nearly one way of it in a straight direction from heel to point; but the flat part of the blade forms a curvature, which varies about four inches from a straight line. The *sneath* or *sneyd*, to which the blade is fixed, is about three feet six inches long, and has one scythe-like handle placed about eighteen inches from the top: when the work is performed, one hand is placed upon the top of the sneath, and with the handle in the other, the crown of the rush roots by a smart stroke of the implement, is scooped out by the concave part of the blade. The most proper season for this business is early in the spring. The rush roots should be carried off to form a compost, and the hod holes, or cavities, filled level to the surface of the land with soil, and hay seeds be sown therein."*

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* Original Report.

CHAP. VI.

ENCLOSING.—FENCES.—GATES.

THOUGH the enclosing of heaths and commons in this county has taken place to a great extent within the last few years, the proportion of uncultivated land still continues very considerable. In the article on *Soil and Surface*, I stated the extent of the waste lands, heaths, commons and woods, to be about 28,600 acres; and that of the peat-bogs, and mosses, to be about 18,000 acres; and it is probable that this calculation may not deviate far from the reality. The land which is occupied by growing timber cannot indeed, with the present high price, and decreasing quantity of that article, be considered as in a state of little profit to the immediate owners, or to the country at large; but the proportion of this is so very inconsiderable, that it can scarcely be taken into the account. A question very naturally suggests itself to the mind on a review of this subject. Might not a large proportion of the lands which at present lie waste be brought into a state of profitable cultivation? and would not the immediate application of labour to this purpose be a measure highly advantageous to the agricultural interests of the country? This question is not so decidedly easy of solution, as, in the first instance, it appears. It may admit of a considerable degree of doubt, whether the same quantum of labour which would be necessary to enclose, and reduce to a state of cultivation, a certain portion of waste land, would not be more profitably applied to the improvement of the land already in a state of partial cultivation. A great number of the fields in Cheshire would yield a third more grass or corn than they do at present, were they properly drained, and marled in a slight degree compared with what waste lands would require. As there is scarcely a sufficiency of labour for the demand, it would be impolitic, in a national point of view, to divert what there is from the greater, to the less opportunity of giving fertility to the country. The question, however, it is evident, is one which does not admit of any general answer; but must be regulated, in individual instances, by the particular circumstances of the case. Some waste lands, from their situation and the nature of their soil, may be brought into a state of excellent cultivation, with comparatively small labour and expense; while, in others, the circumstances are such as to render any attempts at amelioration productive of great expense, and probably of little profit to the undertakers. Under wastes of the latter description may be classed a large part of Delamere forest, and of the elevated land on the borders of Derbyshire and Yorkshire; besides many moors and peat bogs of considerable extent in different parts of the county. The same quantity of labour which would be necessary to enclose and cultivate these, would certainly raise a much greater proportion of produce, if applied to lands already enclosed, but in a state of imperfect cultivation.

It is impossible to say any thing in commendation of the fences in Cheshire. They are, generally speaking, exceedingly bad; and from the slovenly way in which they are made up, answer very imperfectly the purposes for which they were designed. The following remarks on the subject were communicated by J. F. Stanley, Esq.

"The fences in Cheshire are in general very bad. The cops are so broad and high, that a deal of land is wasted; and to furnish the materials, ditches are often made where none are wanted.* When the quickwood dies, it never can be renewed; the cop is too dry; and the beard of dead wood choaks the growth of suckers and sprouts from the old wood. It would often be cheaper for the owner of a farm to make and plant new fences than to repair the old. But no tenant will ever give himself much trouble about the matter. He makes up his fences with dead wood, as well as he can; when he ploughs his land, and when it is laid down, he allows his cattle to have free range through all his pasture fields, and to destroy the fences between them as much as they please. In making new fences, care ought to be taken to make the cop of good soil; if the clay is thrown up to the top of the cop from the bottom of the ditch, the quicks will not grow."

"Gates are becoming a very expensive article; and the stumps being no longer made of the heart of the tree, but of refuse timber, all outside, soon rot at the bottom. Some law is wanted to prevent people from injuring gates. Nothing is more common than for them to be broken wantonly; thrown off their hinges; and to have the irons, on which they are hung, drawn out. Indeed many laws are wanted for the preservation of property out of doors. The only remedy now, against mischief of various kinds, is an action of trespass; which cannot be resorted to against a pauper or stranger, with any good effect, or without great expense."

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* It may be remarked, however, in general, that ditches are more necessary in Cheshire, than in many other parts of the kingdom; from the great quantity of rain which falls in the county, the flatness of its surface, and the prevalence of clay as the substratum.—*H. H.*

Mr. Fenna has made the following communications relative to the modes of fencing.

"The inclosures in Cheshire are generally fenced by hedge and ditch. The ditches are usually three feet wide, and of sufficient depth to act as a drain. The soil and other stuff taken from the ditch is generally formed into a regular cop, upon which the sets are planted (most commonly white, or haw-thorn), which are guarded in their infancy with rails and posts on one side, and sometimes on both, as circumstances may require:- this costs from five to eight shillings per rood of eight yards. This is the common mode of making fences, where new enclosures are wanted. On the sides of roads and commons, where free or slate stone is to be had, a wall is sometimes raised, three or four feet in height, on the side of the ditch next the ground which is to be enclosed; the top of which is levelled with soil to the surface of the field, and planted with thorns, which are likewise guarded with posts and rails. The ancient fences are composed of hazle, alder, white or black-thorn, witch-elm, holly, dogwood, birch, &c. &c. In gardens they are commonly of yew, box, or privet. These fences are kept in repair, and in a certain degree renewed, by cutting or plashing, which is performed in various ways: perhaps the following is the best. All the dead, and a great part of the quick wood, is cut off near the root; leaving some of the best shoots, about half a yard distant from each other. The ditch is then cleansed, and the stuff thrown in among the quicks, to a considerable height, in a regular and neat manner; forming a gradual slope to the summit. The thorns &c. that were left, are cut half way through near the root, and bent to the face of the cop in a vertical position; their tops twisted, and secured by short stakes and hooks, about half a yard high. After which, the back part of the cop is breasted up to the stakes, and appears like a low wall beneath them. This operation costs from 8d. to 1s. per rood of eight yards, and is generally practised previous to a field being put into tillage; the fences being then less liable to damage from cattle."

"The gates most common in the county, and most useful to the farmer, are made of five oak bars, nine feet long, five inches in width, and one and a half inches in thickness at the heel, or end next to the hinges, and gradually tapering to the other extremity, where they are three and a half inches wide, and one inch in thickness. These bars are morticed into a heel-piece, five feet long, seven inches broad, and four and a half inches thick; and likewise through a head-piece, four and a half feet long, and three inches square, two other bars of the same description are then fixed crosswise, the one from the top of the heel to the bottom of the head; the other on the opposite side from the top of the head to the bottom of the heel. They are hung to the posts by hooks, and thimbles of iron; the latch and catch sometimes of wood, sometimes of iron. Few farms have gates to every field; but, in lieu thereof have, frequently two posts, with three holes morticed through each, which admit three heights of rails."

In some few instances, gates made of bar iron have been substituted for oaken ones. The bars in these gates are circular; and are usually four or five in number, with a cross piece, as in the common gate. The original cost varies, of course, according to the number of bars, and the weight of iron employed; but it may be estimated, in general, at from two to three pounds for a gate of the ordinary size. In the present high and increasing price of oak timber, this seems to be an exceedingly valuable substitution. Though more expensive in the first instance, a gate constructed of iron will possess a much greater degree of durability than those now in common use; and when no longer useful for this purpose, the material still retains a considerable portion of its original value.

The enclosures in Cheshire vary very greatly in point of size. Perhaps an average statement might make them considerably smaller than they are in most other parts of the kingdom; a natural consequence of the general smallness of farms in the county. A correspondent makes the following remarks on the division of pasture lands.

" Where a farm is extensive, it is very proper to divide the pasture land into several portions, instead of allowing the cattle to pasture promiscuously over as large an extent of surface, as can be conveniently laid together. The advantages derived from this practice more than compensate for any little additional trouble in driving the cattle. When they are suffered to go over a very large quantity of land in one pasture, they will naturally select the portions of it most agreeable to their taste; while the coarse parts, which they leave, become, in consequence of this, still coarser, and more disagreeable to them. This inconvenience is avoided by dividing the pasture land on a farm, into a number of fields, proportioned to its extent, and to the number of cows that are to be kept; a practice which not only has a tendency to bring the land into a better condition, but is favourable to the cattle, which are always fond of a change in their pasture."*

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* Mr. Holland, of Sandle bridge.

CHAP.

CHAP. VII.

ARABLE LAND.

SECT. I.—TILLAGE.

THE proportion of land occupied in tillage in Cheshire is by no means so considerable as in many other counties; though upon the whole, I believe, I should be justified in stating, that it is more so at present, than it was some years ago. On the greater number of farms, the tenant is restricted, by the terms of his lease, from holding more than a fourth part of his land in tillage; the landlord being unwilling to allow a larger proportion to be employed in a way which is generally esteemed prejudicial to the fertility of the soil. In consequence of this restriction, the corn raisedon many of the smaller Cheshire farms, does not greatly exceed what is necessary for the consumption of the family, and the stock of the farmer. No considerable quantity, of barley is sown, though there appear to be several districts of sandy loam favourable to its cultivation. Wheat and oats, but particularly the latter, constitute the principal objects of tillage in Cheshire; for an account of the culture of which see the article, *Crops commonly cultivated.*

Nothing peculiar can be stated with respect to the modes of ploughing or harrowing usually pursued, or the implements employed for this purpose.

Drill husbandry for Corn. The system of drill husbandry for corn has hitherto been introduced to a very trifling extent in Cheshire; and the generally prevailing opinion among the farmers in this district seems to be, that the adoption of the practice would be attended with consequences rather injurious than beneficial. Among those, however, who have made experiments on this mode of husbandry, there are some who regard the subject in a different point of view. Mr. Holland, of Sandlebridge, informs me, that he has made several trials, in which the application of drill husbandry to corn has been very successful. He says on this subject; " In 1803 I drilled 67 lbs. of wheat on one acre, three roods, statute measure; the produce of which was 53 bushels and 14 lbs., 70 lbs. to the bushel. The seed here sown, was in the proportion of about 39 lbs. to an acre; the average quantity sown by hand cannot be taken at less than 120 lbs. per acre; so that, in this instance, there was a saving of two-thirds of the seed; a point of some importance, where the extent of land occupied in tillage is considerable."

" The following year, I drilled 21 lbs. of barley on one rood, eighteen perches; the produce from which was 15 bushels and 40 lbs. The saving of seed in this instance was certainly above one-half. A similar trial with oats gave, as a result, a saving of two-thirds of the seed usually employed. This present year (1806) I have made another trial of the drill husbandry with oats, but find the produce fall considerably short of what I had expected; a circumstance which, however, I do not attribute to any defects in the system of husbandry, but to my not ploughing sufficiently deep for the crop. Upon the whole, I should conceive that the more general introduction of the drill husbandry for corn, would be an agricultural improvement of considerable importance to the country."

Mr. Fenna notices to me a few experiments which he has made with somewhat similar results. He says, "The small experiment I made last year was very much in favour of the drill and hoe; without the latter, I conceive the drill has no advantage over the broad-cast sowing. Some experiments I am now making, on very poor land, will be decided the ensuing harvest; appearances are at present in favour of the drill. This winter I shall venture upon a more extended scale of experiment."

Another intelligent farmer states it as his opinion, that drill husbandry for corn is not preferable to the old broad-cast system. He allows that a large produce has in many instances been the result of trials made on the former mode; but attributes this circumstance to the particular care which has been taken to have the land in a good state for the experiment, rather than to any peculiar advantages connected with this mode of husbandry.

Dibbling for crops of corn is very little known or applied in this county, though the utility of the practice is undoubtedly such as to entitle it to more general adoption.

SECT. II.—FALLOWING.

It is a question of much importance, and one which has been frequently agitated, whether the fallowing of land might not be more generally dispensed with than has hitherto been done by the farmers in this country. The experience of late years affords strong grounds for an affirmative answer to the enquiry. The more frequent substitution of a green crop for a summer fallow constitutes indeed one of the most material improvements in modern agriculture; and the almost invariable success which, under judicious management, has attended this system of husbandry, renders its further extension an object highly desirable, both in an individual and national point of view. Though the practice is undoubtedly more general in Cheshire, than it was some ears ago, there is still much scope for improvement in this respect; and many thousand acres, which at present lie every year in the state of fallow, might in all probability be covered with turnips, cabbages, or some other green crop, without detriment to the land, and with the most substantial advantage to the farmer.

Wheat in this county has usually a summer fallow, for which there are three or sometimes four ploughings; the first usually in November or December, if the ground be dry, across the butts; but oftener lengthwise. The following May it is ploughed across the former furrows, which is called stirring. In June, if tough and full of sods, the land is rolled, and chopped with a knife-roller; if full of hard clods, with the spike or heavy roller; and then harrowed with heavy harrows. Early in August, it is ploughed up into butts or ridges; often with a small one, consisting of four or six furrows, betwixt each; which helps to lay the land drier, when the original ridges are large. All necessary gutters are then opened. About the middle of September, the seeding is usually begun. The surface is first made tolerably fine and level, with a light pair of harrows; the seed is then sown in the broad cast way, and ploughed under by light even furrows: these are again levelled down with spades or hoes, so as to give a roundness which will allow the water to run off. Every attention is afterwards paid to the cleansing and deepening the gutters, to give a draught to the water, and prevent its remaining stagnant on any part of the field during winter.

When land is winter-fallowed for oats, there are always two, and sometimes three ploughings. The first is in November, when there are three ploughings; the second is at the end of February, or beginning of March; the third at the time of sowing.

In a winter-fallow for barley, there are usually three ploughings; the first in November; in March, the land is stirred across, and harrowed; the third ploughing is at the time of sowing.

SECT. III.—ROTATION OF CROPS.

The following statement, extracted from the original Report, is, I believe, an accurate account of the rotations of crops usually adopted on the different soils in this county.

1. ON STIFF WEAK CLAY LAND.

First year, oats, on one furrow.
Second year, summer fallow.
Third year, wheat, and sometimes oats.
Fourth year, oats, one furrow, and laid down.

OR,

First year, wheat, on a turf fallow.
Second year, oats, winter fallowed.
Third year, ditto, one furrow, laid down, and grazed eight or nine years.

2. ON SANDY LOAMS.

First year, oats on one furrow.
Second year, barley, on winter fallow.
Third year, ditto, and laid down.

OR,

First year, oats, the land marled.
Second year, ditto, winter fallowed.
Third year, barley, ditto.
Fourth year, ditto, laid down, and grazed seven or eight years.*

3. ON WEAK SAND LAND.

First year, oats, one furrow.
Second year, ditto, winter fallowed.
Third year, ditto, ditto, laid down and grazed seven or eight years.

4. ON THE BETTER SORT OF CLAY LAND.

First year, oats, one furrow.
Second year, ditto, winter fallowed.
Third year, summer fallow.
Fourth year, wheat.

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* Upon light soils, the general rotation is oats; barley manured for oats and clover; but too frequently two crops of oats after the barley. Sometimes turnips or potatoes are introduced as a fallow crop, after the first crop of oats; but this is not usually the case, and turnips are by no means so much cultivated upon the lighter soils, as they ought to be. *J. Potts, Esq.*

Fifth year, oats, winter fallowed, and laid down.

Sixth year, summer fallow.

Seventh year, wheat.

Eighth year, oats, laid down and grazed three or four years.*

5. ON THE BETTER KIND OF SAND LAND.

First year, oats, one furrow.

Second year, ditto, ditto.

Third year, turnips marled, and fallowed.

Fourth year, barley, laid down, and grazed four or five years.

6. ON MOSS LAND.

First year, oats.

Second year, potatoes or fallow.

Third year, wheat.

Fourth year, oats and clover.

The following rotation of crops is proposed by Mr. Fenna, for land in a tolerably good condition.

First year, turf, a single furrow sown with oats.

Second year, one or three ploughings, sown with vetches, beans, or peas; if with vetches, and the crop is not full, but mixed with grass, let them be mown soon after Midsummer for fodder, and the ground pin-fallowed, with three ploughings for wheat; if the crop is full, and the ground is good, it may be left to ripen, and afterwards sown on a single furrow with wheat.

Third year, wheat; the stubble of which may be mown, and carted into the yard for manure. In November or December, ploughed for the succeeding year.

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* Land is seldom run through so long a course of tillage as here stated. *Mr. T. Reaver.*

Fourth year, a fallow well dunged for turnips.

Fifth year, oats, or barley, and seeded for pasture.

The rotation of white and green crops is now much more generally practised in Cheshire than formerly; and indeed constitutes one of the greatest improvements which has taken place in the agriculture of this county. It is a system of management highly productive to the farmer; and which, if conducted with any degree of attention, preserves the land in better condition than any other that can be pursued. The following rotation, which, I have been informed, has been adopted with great success on several farms, is proposed for a sandy loam, such as is met with in many parts of the county.

Oats, from turf.
Green crop.
Barley.
Seeds, and graze for first year.
Sow with wheat.
Green crop.
Lay down.

Several instances have come to my knowledge where land has been kept in tillage for a very long continuance of years. I have been informed of one in the neighbourhood of Sandbach, where the farmer had occupied his land in this way for more than twenty years successively, with the rotation of wheat, oats, and fallow. With attentive management, a suitable rotation of crops, and a certain quantity of manure regularly applied, a long course of tillage may be preserved, without material disadvantage to the land:

under other circumstances, the adoption of this practice cannot but be considered as in the highest degree injurious and detrimental.

SECT. IV.—CROPS COMMONLY CULTIVATED.

Under this section the crops to be noticed, are

Wheat.
Oats.
Potatoes.

Wheat.

The common red, or Lammas wheat, is the kind most generally sown in Cheshire. Some years ago, Hart's wheat was introduced into the county by Mr. Wilbraham of Delamere Lodge, who, I understand, procured the seed from Norfolk.* Its cultivation has since that time been very greatly extended; and it is held in high and deserved estimation on the farms where it is sown. Mr. Sutton of Eaton shewed me an uncommonly fine crop of it last harvest; he preserved some of the ears, remarkable for the number and size of the grains which they contained. The cone wheat and white wheat are not much sown in Cheshire; the grain of the former is not reckoned by any means good. Some years ago the spring wheat was brought into the county, and was at one time cultivated to a considerable extent. Good crops of it were sometimes got upon dry well-conditioned land; but this not being generally the case, its culture is now almost entirely abandoned.

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* This wheat is commonly known in the county under the name of *Wilbraham's wheat.*

Much advantage appears to be connected with the practice of frequently changing the seed wheat. This is adopted to a certain extent in Cheshire, but perhaps not so generally as its beneficial consequences would warrant.

Wheat is generally sown on a summer fallow, with three or sometimes four ploughings. The usual preparation of the seed wheat is to steep it in a saturated brine for eight, ten, or twelve hours; and afterwards to add a quantity of lime, to assist the drying of the grains. Two bushels of seed, prepared in this way, is the common allowance to a statute acre. The time of sowing this crop is from the 15th of September to the 1st of November; or later, if the season is rainy. The best time is between the 15th of September, and the 15th of October. Where spring wheat is sown, this is done in March or April; or sometimes as late as the beginning of May. The harvest is generally towards the latter end of August, or the beginning of September, though it is occasionally somewhat later.

The produce of wheat in this county varies from 12 to 30 bushels or upwards per acre, according to the quality of the land, the nature of the season, and other circumstances. The average crop would probably somewhat exceed 20 bushels per acre.*

On the light sandy soils in this county, there is frequently a crop of brush wheat after oats or barley.

An opinion has long been entertained that the barberry (*berberis vulgaris*) produced some noxious effect upon corn, and particularly upon wheat and oats. Withering, speaking of it, says, "This shrub should never be permitted to grow in corn land, for the ears of wheat that grow near it never fill; and its influence in this respect has been known to extend as far as three or four hundred yards across a field."* Since no reason could be assigned for so extraordinary an effect, nor any analogous fact produced, this has generally been regarded as a popular error, and little credit attached to it. Such a strong confirmation of it has however lately come to my knowledge, that I think it proper to state it. About twenty years ago a young plantation on the lands of Sir J. F. Leicester, Bart. was fenced out with a barberry hedge, about a hundred yards in length. On the opposite side, to the north-west of the plantation, was a small enclosure about ninety yards across, held by one of his tenants. Three years ago this was sown with wheat; the crop produced, although the land appeared in good condition, scarcely paid the expense of thrashing; the grain being extremely small, and the quantity of it very inconsiderable. On the following year the field was sown with oats, and the return of the crop was little more than equal to the seed. Last year the field was well limed, and was partly in fallow, and the remainder set with potatoes. In the autumn the whole was sown with wheat, which came up well, looked healthy, and shot into ear at the usual time; promising a crop at least equal to any in the neighbourhood. Soon after, the plant became brown and completely decayed, and when cut, it was thought not worth while even to carry it from the field. I had an opportunity of examining it as it lay there, a few days after it had been cut, and found all the straw was completely rotten, and that every ear of the plant within twenty yards of the hedge had been entirely unproductive, not yielding a single grain of corn. At the distance of twenty, or twenty-five yards, a few very small grains of wheat might be discovered in some of the ears. Still further from the hedge the grains were larger and more numerous; but in no part of the field was the produce sufficiently abundant to induce the farmer to carry it off the ground. The enclosure beyond the wheat field was sown with oats; and this crop also seemed materially to have suffered from the influence of the same cause. All the crops of corn in the same neighbourhood were at least as productive as usual.

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* By this is understood 75lb. to the bushel.

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* Botanical Arrangement, Vol. I. p. 367

To what causes such a singular effect is to be attributed, I confess my incompetency to say. The prevailing opinion is, that the pollen of the barberry in some measure operates in producing it; but it has been suggested to me that the destruction of the seed of the wheat is more probably produced by an insect (of what genus I could not learn) generated on the barberry, and afterwards feeding on the scarcely formed grains of wheat. A larger collection, and more minute observation of facts, seem however necessary completely to ascertain this point.*

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* At the time of drawing up the above account, I had not seen the very ingenious remarks of the Right Honourable Sir Joseph Banks, in his publication on the causes of the blight, &c. in corn. He there notices the effects produced by the barberry on wheat; and suggests the probability of these being derived from a different cause to any which had been before conceived. " It has," he says, " been long admitted by farmers, though scarcely credited by botanists, that wheat in the

OATS.

VARIOUS sorts of oats are sown in Cheshire, but perhaps those in most general cultivation are the Poland, and the Staffordshire white. The potatoe oat has been much sown lately, but does not appear to be so highly esteemed at present, as it was at its first introduction.* Dutch oats are sown to a very considerable extent, though not so much as formerly; it being thought that their crop tends greatly to exhaust the land. The common oat, the Staffordshire white, and the Tartarian,† are sown chiefly upon the poorer description of soils, where they produce a fuller crop than the other sorts, but require to be sown earlier, and are eight or ten days later in ripening. A farmer in 1797 (a bad year for oats) divided fourteen acres into two equal portions; that in which the land was the best, was

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the neighbourhood of a barberry bush seldom escapes the blight. The village of Rollesby in Norfolk, where barberries abound and wheat seldom succeeds, is called by the opprobrious appellation of Mildew Rollesby. Some observing men have of late attributed this very perplexing effect to the farina of the flowers of the barberry, which is in truth yellow, and resembles in some degree the appearance of the rust, or what is presumed to be the blight in its early state."

"It is, however, notorious to all botanical observers, that the leaves of the barberry are very subject to the attack of the yellow parasitic fungus, larger, but otherwise much resembling the rust in corn.

"Is it not more than possible that the parasitic fungus of the barberry, and that of wheat are one and the same species, and that the seed is transferred from the barberry to the corn? If this conjecture is well-founded, another year will not pass without its being confirmed by the observations of inquisitive and sagacious farmers."

* The grain of the potatoe oat is esteemed very exeellent, and were it not that the straw is hard, and disliked by cattle, the cultivation of this sort would in all probability be much extended.

† The Tartarian oat is rarely sown.

sown with the Dutch; the other, with the common oat. The balance of produce was in favour of the latter, by forty measures of grain, and two or three loads of straw.

When oats are sown on one furrow on a stiff soil, the land is usually ploughed soon after Christmas; when on one furrow on light land, it is generally turned at the time of sowing, or a little while before. When the land is winter fallowed for oats, the number of ploughings are in general two; the first in November, the second at the time of sowing. Good farmers, however, frequently give three ploughings; the first in November, the second at the end of February or beginning of March, and the third at the time of sowing.

Of seed oats, four or five bushels are generally sown upon an acre. The time of sowing is from the middle of March to the 1st of May. The earliest are often ready for market the first week in August; those sown later are seldom completely ripe till the end of this month, or the beginning of September.

The produce varies, like that of wheat, very considerably; from 15 to 40 or 46 bushels on an acre. The average crop may perhaps be computed at 30 bushels per acre. Mr. Fenna states it as not exceeding 25 bushels.*

POTATOES.†

The use of this vegetable has of late become so general throughout every part of the kingdom, that its culture is extended to a degree formerly unknown. Several causes have had their influence in producing this effect. The prejudice which once existed against potatoes, as a fit nourishment for man, is now entirely abandoned; and the modern application of them, as food for horses, cattle, pigs and poultry, has very largely added to their consumption. The rapid advance too which has taken place in the price of provisions, and particularly in that of grain, has obliged many to have recourse to this vegetable, who formerly disregarded and despised it as ordinary fare. There is probably no part of the kingdom where this crop is so general as in some districts of Lancashire and Cheshire; the potatoe constituting here not only a material article of food, but in fact the principal subsistence of the labouring people. As the result of particular enquiries made on this subject, I have found that, in numerous instances, six, or even seven parts in weight of potatoes to one of bread, are consumed in families which could by no means be reckoned amongst the lowest class of the community. In addition to the extensive domestic uses to which this vegetable is applied in Cheshire, its cultivation has been greatly promoted in this county, by the very great increase of population which has taken place, within the last century, in the southern districts of Lancashire; producing a proportional increase of demand for every species of agricultural produce, and more especially for this most useful species, the potatoe. The Man-

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* The bushel here alluded to, is 50lb. to the bushel.

† In drawing up this article, I have received the most material and

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important assistance from George Wilbraham, Esq. of Delamere Lodge; a gentleman whose exertions for the promotion of agricultural improvement are highly worthy of general imitation.

chester and Liverpool markets are very largely supplied with this vegetable from the northern parts of Cheshire; the former town principally from the neighbourhood of Altringham and Frodsham; the latter, in a great measure, from the hundred of Wirrall. As the cultivation of the potatoe differs, in some respects, in these several districts, it will be necessary, in describing it, to make a more particular reference to each of them.

Potatoe culture at Frodsham.[*]—In the parish of Frodsham, situated at the mouth of the Weaver, potatoes are cultivated with as much success, and probably to as great an extent, as in any other district of equal size in the kingdom. It has been estimated that considerably more than 100,000 bushels, of 90lb. weight, have, for some years, been annually grown in this parish; of which by much the larger proportion is carried to the markets in the south of Lancashire. The situation of Frodsham is extremely advantageous for this purpose; the river Mersey, and the duke of Bridgewater's canal, which are immediately contiguous, affording a cheap, easy and expeditious mode of conveyance to these markets.

A considerable depth of dry, light, or loamy soil is esteemed the most suitable to the cultivation of the potatoe in this district; though I am informed, that it may be grown on any description of soil whatever. The mode of culture usually pursued is the following. The land is ploughed before Christmas, to receive the meliorating influence of the frosts; in April, it is ploughed across, torn and pulverized with the harrow; after which, it is ploughed deeply into buts of three or four feet in width. At the latter end of April, or the beginning of May, it is prepared for setting; which is performed with a kind of dibble in the form of a spade handle, having a peg run through it, eight or nine inches from the bottom, to set the foot upon; and shod with iron for about five inches, that it may penetrate the soil with greater facility. The holes are made at the distance of eight or ten inches apart each way. Women and children are usually employed in doing this, so that the expense connected with it is very inconsiderable. About three weeks after this time, or as soon as the shoots begin to appear, they are covered with about two inches of soil, spread equally from a trench, dug between the beds; which operation is not only beneficial to the potatoe plants, by giving an addition of fresh mould, but has also a tendency to check the growth of, and indeed in a great measure to destroy, the couch grass and other weeds which may make their appearance upon the land. When the plants appear in full row, the ground is hoed, and afterwards kept clear from weeds by the hand, until the plants have covered the ground. The proper time for getting up the potatoes varies according to the description of land on which they have been planted, and the nature of the season. It may be remarked, in general, that when the branch is dead, the root is ready. In digging them up, which is usually done with a common three-pronged fork, great care should be taken to pick out all the couch grass, and to carry it off the field. If this be done properly, the land is, in general, left in a state of excellent preparation for a crop of either wheat or barley, if the ground has been sufficiently manured previously to the last ploughing for potatoes.

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[*] For the facts relative to the potatoe culture in the parish of Frodsham, I am indebted principally to the original report of the county, and to the communications of Mr. Antwis of Frodsham.

The application of manure in the culture of potatoes, in this district, is a point which merits attention. Mr. Antwis informs me that he never uses manure for a crop of potatoes, but is in the habit of laying down his land immediately afterwards; a method which he seems to consider as more advantageous than that of employing manure for potatoes with a view to a succeeding crop of wheat or barley. The latter mode of management is, however, very generally adopted in the neighbourhood of Frodsham. Indeed it seems to be the general opinion that the culture of potatoes has a tendency greatly to impoverish the land upon which this crop is grown; and under that persuasion the yard dung in Cheshire is too much lavished upon the potatoe ground; though, in some instances, this practice is guarded against by a particular covenant between the landlord and tenant. That so heavy a produce, as is usually raised from land planted with potatoes, must have the effect of exhausting the land for the time, can scarcely be doubted; but many persons, fully competent to judge upon the subject, are of opinion, that the deep ploughings, the turning up the whole with the spade or fork, and the eradication of the couch grass and other weeds, completely counterbalance any injurious effect of this kind, even though no manure be used. Mr. Antwis states it as his opinion, that potatoes are not in any peculiar degree an exhausting crop; and that, under judicious management, a farm on which they have been made a particular object of cultivation, may be as little impoverished, as it would have been with a different course of culture. He likewise informs me that no crops are better adapted than those of potatoes for bringing marshy or barren land into a proper state for future cultivation.

I may notice here a practice pursued at Weston, near Frodsham, in the culture of potatoes, which seems deserving of attention. At this place, situated close to the junction of the Mersey and Weaver, sea mud is used as a manure for crops of potatoes; twenty loads being the quantity usually laid on an acre. The ground thus manured not only gives a large produce of potatoes, but is in a state of excellent preparation for a succeeding crop of either wheat or barley. The adoption of this practice has increased very greatly the value of land about Weston.

The quantity of manure used for potatoes, in the neighbourhood of Frodsham, varies from twenty to thirty tons on an acre. This is procured at the rate of six or seven shillings per ton, and is spread upon the land previously to the last ploughing. Three ploughings and one harrowing may be estimated at about 25*s*. per acre. In planting, fifteen bushels to an acre is the quantity usually employed: the various processes of making the holes; cutting and putting in the sets; covering them; with the hoeing, weeding, &c. afterwards, are attended with an expense of about 6*d*. or 7*d*. per rood of 64 yards; getting up the crop costs about 6*d*. per rood. The average produce on good land, and with proper management, may perhaps be stated at 250 bushels, of 90lb. each, per acre. The price of potatoes in the markets is varied considerably by the season and other circumstances; the different kinds too bear different prices according to their qualities, some being better adapted for table use, others for feeding of cattle. "When the ox-noble sells for eighteen-pence a bushel, the Irish apple will sell for half-a-crown.*"

"On shallow soiled land, potatoes are generally planted, and soiled with the plough, a method which consumes less manure than that before described. In this mode of planting (the land being prepared as before) a furrow about four inches deep is turned; the manure is spread lightly in the hollowed space, the potatoe sets having been† previously dropt at the distance of about eight or ten inches asunder; the same furrow is then turned back upon the sets; the next row of sets is dropt, and covered with manure in the hollowed space of a furrow, which is turned towards the first row, at the distance of about eighteen inches from the first line of sets, viz. leaving something more than two furrows width of soil untouched by the plough; the sets and manure are then covered as before, and the same method pursued till the whole of the ground intended to be planted is finished. Soiling with the plough is thus performed. As soon as the plants begin to appear, the ground which had previously been left untouched is split or turned to each side upon the young plants, with a long wrested plough, so as effectually to cover them. After this has been done, the crop is to be kept clear of weeds by the hand and hoe. Land for potatoes is very frequently hired of the farmers by gardeners or labouring people at from five to six pounds per acre;‡ and when it is considered that the interest of the hirer extends no further than for one year, it is not to be wondered at, if (as frequently happens on light and weak soils) the land is left, after a crop of potatoes, in a much worse state than it was before; on the contrary, if the crop is a good one, and the ground is properly worked and cleaned at the time of getting it up, the land may be made as clean from couch grass and weeds, as any other kind of culture can possibly make it. But the object of the poor man is to free the land of the potatoes, not of the couch grass, which it may contain, and it will generally be found to require a very constant attendance from the farmer, to see that the latter is properly effected."*

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* Mr. Antwis.

† It is at least as common a method to lay the sets upon the dung; and in this way they vegetate much more speedily than when laid under the dung.

‡ It now lets as high as eight or nine pounds per acre.

The kinds of potatoes most generally cultivated in the parish of Frodsham are fox's seedlings, and perrins, for the first crop. The winter potatoes are principally the ox-noble and Irish apple. The kidney potatoe is now never planted in this district, though its cultivation was formerly attended to.

When the crops are favourable, very considerable quantities of the potatoes raised about Frodsham, and particularly of the ox-nobles, are given by the farmers in the neighbourhood, to different kinds of stock; feeding-cattle, milch-cows, horses, hogs, sheep, &c. The success, which I am informed, attends this practice, and the extent to which in many instances it has been carried, renders it an interesting subject of enquiry. Mr. Antwis informs me, that he frequently applies not less than 2000 bushels of potatoes in a year to this purpose, and states it as his opinion that it is as good, if not a better, food for cattle of every description than turnips: this however is by no means the general idea on the subject. Some variety of opinion exists as to the most eligible manner of giving this root, whether boiled (which is done either in steam or water), or unboiled: both of these modes are practised, and have their respective advocates. Cattle are more partial to the food in the former state; to horses, however, potatoes are frequently given raw, among other provender, and answer extremely well in this way. An addition of chaff, or rough oats, is commonly made to counteract their laxative effect; about two quarts of this provender being usually mixed with six pounds of potatoes, and so on in proportion. It has been remarked to me, by a gentleman whose opinion on this subject is entitled to great deference, that, if eaten raw, potatoes are much the most nutritive when they have begun to sprout. This certainly holds good in the instance of barley, and malt; and, in all probability, may be further extended to other vegetables secreting a saccharine juice at this period.

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* Original Report.

Mr. Antwis has noticed to me a practice connected with the potatoe culture in the neighbourhood of Frodsham, which is worthy of mention from its singularity. In this district it is customary for the farmer to make a sort of contract with his labourer; the former pays the rent of the land; the labourer finds the sets, plants them, attends to them while in the ground, and gets them up; for which, instead of wages, he receives one half of the produce. The quantity of land usually allotted to one labourer in this way, is about two statute acres.

*Potatoe culture in Wirrall.** From the situation of the hundred of Wirrall, between the estuaries of the Mersey and Dee, the climate of this district is mild and temperate, and peculiarly favourable to the cultivation of potatoes. The immediate vicinity of Liverpool, creating a large demand for this vegetable, has given rise to an improved mode of raising the early kinds, which deserves the attention of the practical agriculturist. The following is the method pursued. The potatoes designed for the sets are got up in September or October, or even before; the sooner after they are mature, the better; and in November are laid up in a warm dry room, where they are spread rather thinly, not more than two, or at most three potatoes in thickness, and covered with wheat chaff, or dry sand. They are further protected from frost, whenever it is necessary, by a blanket or rug spread over them. By this mode of management, they are generally well sprit by the month of February or the beginning of March; if this should not be the case, the sprouting is accelerated by sprinkling them from time to time with a little water. A potatoe is said to be well sprit, when it has a shoot from two to four inches long, as thick as a small quill, and terminated by two little leaves. In this state they are planted whole; all the shoots being cut off, excepting one, as early in February as the season will allow; they are set not more than five or six inches asunder, the tops just within the ground. As long as there is any danger from an exposure to the frosts, they are carefully protected by a covering of straw or pease-haum; which is taken off in the day, unless the weather be extremely severe, and put on again at night. By this management, potatoes are now as plentiful in the Liverpool market, in the middle of May, or even sooner, as they were, before it was practised, in the middle of June. At the same time, the culture of this vegetable is productive of very considerable profit to the farmer; a second crop being, in almost every instance, raised from the same land in the same year.

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* With this account of the culture of early potatoes in Wirrall, I was favoured by the Rev. R. Jacson of Bebbington.

The land is always manured for potatoes in Wirrall, except where a naturally rich spot, or one that has some time before been well manured, is allotted to the early crop. Under these favourable circumstances, both this crop, and that which is allowed to come to maturity, are generally much better in kind than is otherwise the case.

The early kinds of potatoes, held in most estimation in this district, are the early Manleys; the fox's seedlings; the Broughton's dwarfs; and some other sorts; all of which it must be remarked never blossom: the kinds usually grown for the winter crop are the pink eye, the ink eye, the Scotch white, the ox-noble, &c. Besides these, there are some very good sorts ripe in August or September, and continuing fresh till Christmas: to these, various names are given, but it seems probable that they were all originally from the same stock; and that any difference now found among them, is the result of differences in the mode of their culture, or of varieties produced from the same species.

The crop of those potatoes, which acquire their full growth, varies in this district, from 150 to 250 bushels of 90lb. each, on a statute acre. The pink eyes generally give the smallest, the ox-noble the largest produce. Considerable quantities of the early potatoes are sent to the Manchester and Chester markets, as well as to Liverpool. Good eating potatoes sell for 1*s*. 6*d*. 2*s*. and in the spring for 3*s*. per bushel; the ox-noble for 1*s*. or 1*s*. 6*d*. The early potatoes vary very much in price. When they are first brought to market, they are sometimes as high as 2*s*. 6*d*. per pound; and, as the season advances, sink gradually down to 1*d*.

The practice of giving potatoes to cattle, &c. in Wirrall, is not so general as, of itself, to afford any inducement to their culture. Where they are given, it is generally in the raw state: sometimes however they are boiled by steam for this purpose.

Potatoe culture about Altringham.—Of the early kinds of potatoes the fox and the green seedling are those principally cultivated in this district; some farmers giving the preference to one kind, some to the other. Several other early sorts are known in the neighbourhood; but, as they are not in general such free bearers, their culture is not much attended to. Of later kinds, the white and red champion are those most generally planted, being good potatoes till the month of August, and bearing well. The latest kinds for winter are numerous; but the potatoe, called from the darkness of its colours the sweep, is now that the most frequently planted; it bears very plentifully, and continues good during the whole of the winter.

The time of setting potatoes, in the neighbourhood of Altringham, is from February to the beginning of June; according to the sorts planted, and the time they are intended to be got up. A dry sandy soil, and tolerably warm situation, is always preferred for the early sorts; but for the later kinds, a cooler bottom is more generally chosen, provided it be not a stiff clayey soil. The usual mode of setting them is in drills, either with the plough or spade, according as the land is more easily kept clean by horse, or hand hoeing. There is a great variation in the produce; three hundred bushels an acre is however esteemed a very fair crop.

The principal market is Manchester and its neighbourhood; but in seasons when the crop is plentiful, large quantities of potatoes are mixed with other provender, and given to the cattle; a practice which Mr. Whitelegge informs me, has been pursued with great success and profit by the farerms in this district.

Common potatoe culture in Cheshire.—Independently of the particular districts, which have been mentioned, the cultivation of the potatoe is carried on to a great extent in every part of Cheshire; both on the more considerable farms, and on the small spots of ground attached to the cottage of the labourer. Where potatoes are set by the cottager for the early supply of the market, a bank sloping to the east, or south-east, is usually selected for this purpose; and much pains is taken to guard the crop from the spring frosts, which, in the course of a few hours, will frequently blacken, and destroy every leaf that has appeared above the surface of the ground. Probably if a southern, or south-western bank, was substituted, which would be less exposed to the influence of the morning sun, the frosts would be less destructive, and the crops earlier and more abundant. It is with vegetable as with animal life; effects highly injurious are produced by sudden changes in the action of the vessels, whilst no evil is experienced when such changes are made by a more gradual operation.*

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* On the same principle, when potatoes have been exposed to a sharp frost, the best method of counteracting its effects is to cover them with mats, or straw, before the morning sun can have any influence upon them: they will thus be secured against a too sudden transition from cold to heat. Water poured on them would have nearly the same effect; for, however cold, its temperature would always be considerably

The mode of potatoe culture usually pursued by the cottager varies but little from that described as practised in the parish of Frodsham. A space is left between the beds, proportioned to their width and to the depth of the soil, that the plant may be covered as soon as it appears above the surface. This is generally done by the cottager with a spade, and is esteemed of the most essential service to the crop: it preserves the early kinds from the frosts; and by adding soil to the beds, gives encouragement to the potatoe to form near the surface, where the best are always found. For eradicating the couch grass a fork is usually employed, being less apt than the spade to divide the creeping fibres of the couch. Where the cottager is in possession of a pig or cow (which is now much more generally the case than formerly), the manure obtained from these is put upon his potatoe ground; or, if he lives near a high road, his children are employed in collecting the dung from the passing horses; in short, every article that can be scraped up is applied to his crop of potatoes. Turf ashes, I am informed, have been used with considerable success in a moist season; but they are apt to make the potatoes scabby: pig dung is esteemed one of the best manures for this crop.

The common method of keeping potatoes, during the winter, is to pile them up into heaps of considerable size, for which a foundation has been previously secured by a small excavation made in the ground.

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considerably above that of the frozen dew which hangs on their leaves; and it would gradually restore a healthy action of their vessels. The mortification of a frozen limb would be the inevitable consequence of a too sudden exposure of it to warmth; whilst the circulation is restored, and the life of the part preserved, by immersing it in snow, or bathing it with the coldest water which can be procured.

These heaps are covered with straw and mould, and sods are laid over as a superficial covering to the whole.

The contracts made by the cottager, for the land on which he cultivates his potatoes, are of various kinds. In some instances, he has it rent free for the year, on condition of laying on a sufficient quantity of manure: in others, the cottager furnishes the manure, which is carried, and the land prepared by the farmer; the former planting and attending to the crop while in the ground, and paying a higher or lower rent, according to the value of the land. If these agreements are properly adjusted, no better or more profitable system of husbandry can be pursued. The cottager is accommodated with land for potatoes (a circumstance which adds materially to the comforts of his situation); while the farmer has an excellent preparation for a future crop, either of wheat or barley, without the necessity of an unprofitable fallow.

General remarks.—The various kinds of potatoes which were formerly known, and cultivated in this county, are now almost totally lost; and other kinds have been substituted by raising new varieties from seed. In doing this, some mystery is pretended; but I am clear, that there is, in truth, none. The potatoe apple is gathered when ripe, and is kept dry during the winter; the seeds are sown in spring, and the plant transplanted, after it has obtained a certain size. The varieties thus produced are infinite; but their value is never perfectly ascertained during the first year or two of their cultivation. It has been observed that the produce from seed partakes frequently of the qualities not only of the mother plant, but of other kinds which may have been propagated in the neighbourhood.

A singular idea is prevalent among many who cultivate potatoes in this county, that by planting the green tubers, which sometimes proceed from the stem, the sort is renewed, if wearing out; but, upon enquiry, I find no facts sufficiently substantiated to confirm this opinion. A gentleman of very superior information on this subject expresses it as his decided opinion, that no benefit can possibly arise from the pursuance of this practice.* In answer to a query put to the same gentleman, by Mr. Wilbraham, whether artificial heat might not be of use in raising potatoes from seed, as this plant was originally a native of a warmer climate than our own; he states it as his practice to raise them in a hot bed, to harden them by degrees, and plant them out in May; by which means he has had a very considerable produce even the first year. He further adds, that he has discovered a method of making the early kinds blossom and bear seed, which they do not generally. This is effected by planting cuttings from the roots at the foot of a strong stake, and washing away the mould from the base and the stems, whence the tubers would have sprung. A conjecture is offered by him, that varieties of the potatoe, still earlier than those now in cultivation, may be obtained; and that it might be expedient to attempt this by the insertion of the farina into a larger, and moderately, early variety, with the view of producing an early kind of a larger size. If success attended this experiment, its utility would be very great; as in the event of a failure in the corn crop, the planting a small additional portion of land with potatoes would afford a very seasonable relief during the months of June, July, and August, when the corn is usually at its highest price.

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* Thomas Andrew Knight, Esq.

Another remark made by the same ingenious gentleman is, that the disease of curled leaves appears to be occasioned by moulding the plant; and that the way to prevent it is to allow the potatoes to remain in a moderate heat during the winter: somewhat late in spring they begin to shoot; let the young shoots be taken off, when two or three inches long, from the tuber, and planted as sets, and the plants these afford will be entirely free from the curl.

I am aware that these remarks have appeared in the Philosophical Transactions, in a paper of the Society of Arts, and in a communication to the Horticultural Society: some apology may therefore seem necessary for repeating them to the Board; but as this Report may possibly fall into the hands of some, who are interested in the cultivation of potatoes, and in the raising of this plant from seed, and who may not have had access to these publications, I trust my wish to let such persons profit by the ingenious and useful remarks, I have been permitted to communicate, will be a sufficient excuse for their insertion.*

SECT. V.—CROPS NOT COMMONLY CULTIVATED.

The crops to be noticed as not commonly cultivated in this county, are,

Barley,
Turnips,

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* I understand that Mr. Knight proposes entering still more minutely into these subjects, in communications to be made to the Horticultural Society.

Cabbages,
Kohl Rabi,
Beans,
Peas,
Carrots,
Onions,
Buck-wheat, Rye, &c.

BARLEY.

Barley must certainly be reckoned among the crops not commonly cultivated in this county, a circumstance which may principally be attributed to the unfitness of the soil in general for this crop; though there are some particular situations in the county, where it is found to answer better than any other description of grain. The kinds of barley most generally sown are the common, and the sprat barley; the bear barley is sometimes sown where the soil is of richer quality. Of the two former kinds, four bushels of seed are usually sown upon an acre: the latter, from the smallness of its grains, and the number of stems produced from a single grain, yields, upon suitable land, a strong crop, with only two bushels of seed to the acre. Where the land is winter-fallowed for barley, there are generally three ploughings; the first in November; the second in March, when it is ploughed across, and harrowed; and the third at the time of sowing. Barley is sown in this county towards the latter end of April, or in the first week in May; though the time is considerably varied by the season, and other circumstances. It is ripened, and cut about the same time as the latest oats, or the wheat. The produce on an acre varies from fifteen to forty bushels: perhaps twenty-five bushels per acre may be stated as a fair average.

TURNIPS.

The more general introduction of green crops, and their extended application as food for cattle, is undoubtedly one of the greatest improvements which has taken place, of late years, in the agriculture of Cheshire. In the middle, and southern parts of the county particularly, every dairy farmer has now his field of turnips and cabbages; which he uses for his milch cows, during the winter and spring months. In the hundred of Wirrall, these crops are by no means so frequent; though an extension of their growth would in all probability be a source of considerable advantage to the dairies in that district. For some remarks on green food for cattle, stall feeding, &c. see the article on *Cattle*.

Among the green crops cultivated in this county, the turnip is perhaps the most important. The kinds of this root principally grown are the common turnip; and the *ruta baga*, or Swedish turnip. The culture of the latter has increased very much of late years; and it is upon the whole one of the most beneficial crops which the dairy farmer can grow upon his land; as well from its intrinsic value, as from the excellent condition in which, under proper management, it leaves the land for a succeeding crop of oats or barley. It is, in several respects, superior to any other kind of turnip;

nip; yielding a more considerable weight of produce, and being less injured by the severities of winter. The latter is an advantage of the greatest moment to the dairy farmer, securing to him a supply of green food for the spring use of his cattle, which will keep for several months after being taken up.

On some of the principal dairy farms in the county, the drill husbandry is now employed for turnips.* This mode of culture is found highly beneficial, from its answering in a great measure the purposes of a fallow. If proper attention be paid to cleaning the land from weeds, &c. while the crop is on the ground, the soil is found to be very little exhausted by it: where the farmer is not careful in this respect, it is natural to suppose, that the reverse must be the case. It has been doubted whether as large a produce is obtained by the drill, as by broad-cast husbandry. This however, it is evident, must depend, in a great measure, upon the management pursued in individual instances. The latter mode is generally practised in the county.

The soil esteemed most favourable to the culture of turnips is a strong sandy loam. The manure generally employed, is a farm-yard compost.

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* Drill husbandry appears to me preferable for green crops in general: I always practise it upon my farm.—*Mr. Sutton.*

The want of labourers is the main objection to the drill husbandry. There can be no doubt, but that both the crop and the land would be benefited by being kept clear from all weeds. A farmer can seldom command labour at the moment he most wants it. A gentleman, who has throughout the year employment for many hands, may do it. In recommending any practice, therefore, which he may have found to answer on his farm, he should consider well whether he has not means of executing it, which others, in different circumstances, may not possess.—*A Correspondent.*

The following is the most approved mode of culture for Swedish turnips, at present practised in Cheshire. The seed is sown towards the latter end of April. If the weather is favourable, the turnips are ready to be transplanted early in June; sometimes, however, the badness of the season causes this to be protracted, till the middle, or latter end of July. The land is drilled into ridges, two feet, or sometimes, thirty inches asunder; the manure is then put in; two furrows thrown upon it, and the plants set at the distance of about twelve or fourteen inches apart in the row.*

When weeds spring, the ground is ploughed from the plants, and afterwards up to them again. These ploughings are repeated, till the plough can no longer be employed without injury to the plants. The hoe is then resorted to for cleaning the ground. If proper attention be paid to this point, the produce of a crop of Swedish turnips, grown in the manner described, will sometimes considerably exceed 20 tons, on a statute acre. The average produce in the county cannot probably be taken at more than 10 or 12 tons per acre.†

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* In some places, I have seen the plants set at the distance of seventeen or eighteen inches asunder in the row; and the land has appeared to yield a greater produce, than when they have been set closer.—*H. H.*

† Since the above account was drawn up, I have received, from Mr. Cragg, a statement of the actual weight per acre of a crop of Swedish turnips, which were grown in Toft this present year (1806); and were managed according to the method which has been recommended. The estimate was made by weighing, and taking as an average of the crop, six separate roods, in different parts of the field, not particularly selected as the best; avoiding only a few spots where the turnip had been destroyed by the drought or the wire-worm, and one part which had been shaded by a row of elms.

The weight of the turnips, on a rood of eight yards square, was found to average 785lbs., or three loads and 5lb., of 13 score to the load; equal to 227 loads; or 21 tons 16cwt. 2qrs. 15lb. the statute acre.

Some farmers make a point of getting up a part of their crop of turnips before the severe frosts set in, that they may secure a constant supply for the winter. These turnips are laid out of doors in a long heap, about two yards in breadth at the bottom, and rising to a point at the top; this is completely covered with thatch. In this way, they keep perfectly good till the spring is considerably advanced. The remainder are kept in the ground till they are wanted, and frequently continue quite sound till the latter end of April.

CABBAGES.

This crop, like the former, is much more generally cultivated in Cheshire than formerly, and is held in equal, if not in greater estimation, as green food for cattle.* The ox-cabbage is reckoned particularly valuable for this purpose, and many of the principal dairy farmers are now in the habit of growing five or six acres of it annually, which they give to their cattle in the autumn; by which practice, an advan-

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The tops on each rood averaged 75lb. or nearly 2½ tons per acre.

Such of the turnips as could be spared were sold at four shillings the load; or after the rate of 45l. 8s. the acre. If to this be added 24 loads of tops, at 2s. per acre, the entire value of the produce would be 47l. 16s. per acre.

I do not find that any accurate account was kept of the expenses of cultivation; so that we are unable to ascertain the amount of the clear profit.

* The cabbage is, in my opinion, the best green crop for the dairy. The cattle fed upon it give more milk than when fed upon turnips; and it does not communicate that disagreeable flavour to milk, butter, and cheese, which is sometimes done by the latter food.—*Mr. Manley.*

tage is gained, both in the quantity, quality and continuance of the milk.*

If proper attention has been paid to cleaning the ground from weeds, and if the cabbages are eat in time, the land, on which the crop has been grown, will generally give a crop of wheat, as abundant as after a summer fallow.

There is a sort of garden husbandry lately introduced into the neighbourhood of Warrington, which seems highly deserving of attention. It consists in the growth of early potatoes, with alternate rows of ox-cabbage. The potatoes are set as early as they can be, so as to be safe from the frosts; they are taken up in June, or the beginning of July; and the cabbages, which have been planted in alternate rows, left, to remain as winter food for the cattle. The Reverend George Heron of Daresbury, who favoured me with this account, informs me that he this year (1806) planted four acres with (fox's seedling) potatoes, in drills of four feet asunder, well manured, and cabbages set in every other drill. The potatoes he sold at Manchester, for upwards of £.40; and he has an excellent crop of cabbages now growing, which nearly cover the ground. When the potatoes had been taken up, the drills on which they grew were turned with the plough up to the cabbage drills, which earthed up the plants, and left the ground perfectly clean. Mr. Heron adds, that, whenever he practises this method again, he intends making the drills at the distance of three feet three inches, instead of four feet, which he thinks will leave sufficient room both for the potatoes and cabbages.*

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* The ox-cabbage produces more milk, of a richer quality, and continues it longer in the winter, than the best after-math could do.—*Mr. Sutton.*

KOHL-RABI OR CABBAGE TURNIP.

This plant has been but lately introduced into Cheshire, and its merits have not hitherto been ascertained with sufficient accuracy.

A few of our principal dairy farmers have made use of it as a substitute for the Swedish turnip in the winter feeding of cattle; principally in the way of experiment. On enquiry, I find that their opinions, with respect to its comparative utility, are not precisely similar. Mr T. Renier informs me, that, from a trial he has made of it, he has reason to suppose that it will be of the greatest value on dairy farms; being equal, if not superior, to any other description of green food now in use. I have heard other farmers, on the contrary, state it as their opinion, that it is considerably inferior to the Swedish turnip: and I am led to believe from several circumstances which have been mentioned to me, that this is really the case; though I confess myself by no means competent to speak decidedly on the subject. The Kohl-rabi is certainly an extremely hardy plant, bearing the winter remarkably well, and retaining its freshness till the latter end of May. Cattle too are fond of it. But to determine whether it is superior to the Swedish turnip in these respects, requires a longer, and more extended trial, than has yet been given to it.

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* On stating the substance of this account to a very intelligent friend, he furnished me with the following judicious observations. "There can be no doubt but that the nearer agriculture approaches to horticulture the better; and every farm, in the neighbourhood of large towns, which can furnish manure in abundance, and a good market, may be successfully converted into a large garden. But the want of manure, the want of a near market, and the want of labourers, must always make it hazardous to divert farmers in general from their accustomed mode of agriculture. They cannot be expected, nor would it be wise to recommend it to them, to cultivate such crops, as are altogether dependant on the seasons, and which require excessive care. A long course of experiment, by those who can afford to suffer loss, should follow every new suggestion. So many various circumstances affect success; so many objects are to be kept in view at the same time; such a balance must be made of the sacrifices necessary on the one hand, against the insurance of an advantageous result on the other; that on very few points indeed can any given system be pronounced either good or bad. The very best recommendation of any new method, or any new discovery, is the constant steady prosecution of it, by the person recommending it. Few farmers are so prejudiced, or so blindly attached to old customs, as not to be convinced of the utility of what they see to be uniformly, and unequivocally productive of advantage."

BEANS.

This crop is not commonly cultivated in Cheshire, though more so than formerly, and, in general, with great advantage to the farmer. It is an excellent preparation for wheat, and its more general substitution for a summer fallow would be an improvement of much importance in the agriculture of the county. Many farmers have indeed already adopted this practice; and their success will probably lead to its extension. Both the broad-cast and drill husbandry are employed for beans; the latter is preferred by several intelligent farmers, as, by this mode, with an equal crop, the land has more of the advantages of a fallow, and may be more effectually cleared from weeds.

I have this year seen (1806) a crop of beans in Toft, superior in quantity and quality, to any I have before had an opportunity of observing. This crop was taken after oats. The land (thirteen acres in extent) was fallowed immediately after the oats were got off; harrowed; and brought into condition to be drawn into ridges before winter. The ridges were two feet asunder; perhaps a greater distance would have been preferable, as a breadth of two feet is scarcely sufficient for a horse to pass along for the purpose of clearing. The ground lay in this state till the beginning of March, when the beans were set between the ridges, three inches asunder. Ten women, having the whole length of the field divided among them, dropped the beans, as fast as a man with one horse and a plough could follow, to throw the two furrows over them. In this way, two statute acres were set in the course of a day. The cleaning from weeds was performed in the same manner as for the Swedish turnip. It was found necessary however to go over the ground with a hoe, after the plough could no longer pass without injuring the plants. Part of these beans were the Mazagan, and the remainder the common small horse bean. The crop was cut towards the latter end of September; and, on thrashing them, it was found that the Mazagans yielded sixty bushels, the common horse-bean 44 bushels, of Winchester measure, per acre. The weight of the Mazagans was from half a pound to a pound per bushel more than the horse-beans. The former possess a further advantage in being ripe at least a fortnight earlier than the latter; which allows more time to prepare the ground for wheat; with a crop of which it is intended, in this instance, to follow the beans.

Mr. Cragg of Toft, who favoured me with the preceding account, states it as his opinion that beans are by no means an exhausting crop; and thinks the succeeding crop of wheat will be as abundant as after a summer fallow.

PEAS.

Peas are likewise cultivated to a considerable extent in the neighbourhood of Altringham, though they cannot be reckoned among the crops commonly cultivated in Cheshire. They may be sown upon any sort of soil, that is in a tolerably good state; but a sandy loam is, in general, preferred for the early kinds. Seven hundred, or seven hundred and fifty pecks upon an acre, is considered to be a fair average crop, being sold at from sixpence to a shilling per peck, in the Manchester market.

CARROTS.

Though the cultivation of this vegetable is carried to a very considerable extent in the neighbourhood of Altringham, it cannot with propriety be reckoned among the crops commonly cultivated in this county. The mode of culture usually pursued, in this particular district, is exceedingly simple. A dry loamy soil is chosen, and is fallowed with a light furrow before Christmas; it is soon after dug, that the frost may act upon the soil, and prepare it for being raked fine, when the seed is sown, which is generally done towards the middle, or latter end of March. The only kinds of seed sown in the neighbourhood of Altringham, are, what are called the London, and home-seed. The latter is raised by the gardeners in the neighbourhood, and is very generally preferred to the London seed, being frequently sold for four times the price.* The produce varies greatly, according to the nature of the soil, and of the season. Ten or twelve tons, or about 350 bushels per statute acre, are, I understand, reckoned a very fair produce; now and then the farmer obtains fifteen or sixteen tons; in other seasons not more than four or five.†

Manchester is the principal market for the carrots grown in the neighbourhood of Altringham; the conveyance to that town by the duke of Bridgewater's canal being at once cheap and expeditious. When the crops however are plentiful, considerable quantities are given by the farmers in this district to their horses and cows; and they are held in deserved estimation for these purposes. Mr. Whitelegg informs me that cows, when fed upon them, produce more, and better milk and butter than with any other kind of food; and it appears not improbable that the culture of this vegetable with a view to the feeding of cattle, may become considerably more general in Cheshire than it is at present; especially in those parts of the county where sand, or a sandy loam, prevails. I have been informed indeed by an intelligent agriculturist in this county, that he has obtained a very abundant crop of carrots on a piece of stiff clay ground, by previously laying on it a quantity of sand; and by this means producing a kind of loamy soil. Sand thus applied serves as an useful manure. In the culture of carrots, however, the comparative uncertainty of the crop is a circumstance which tends, in some degree, to diminish its value with the farmer.

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* Mr. Whitelegge.

† Carrots being sold in the markets in this part of the country by weight, the farmer is accustomed to estimate in the same way the produce of the land which he devotes to the culture of this vegetable.

ONIONS.

The cultivation of this vegetable, to any great extent, is confined, like that of the carrot, to the neighbourhood of Altringham; where considerable quantities are grown for the supply of the Manchester, Bolton, and other Lancashire markets. The soil esteemed most suitable to the growth of onions is a black loam upon a cold bottom: land newly improved by draining &c. is preferred to that which has been for some length of time in tillage. The mode of culture pursued in the neighbourhood of Altringham is to plough the land in large beds, of from six to eight or nine yards in width; then to harrow it well, and sow the seed. It is afterwards raked with a common garden rake, and trod out into smaller beds, about four feet in width, across the large beds. This is done for the greater convenience of weeding; a process which should particularly be attended to in the cultivation of onions, as it is absolutely necessary to ensure the success of the crop. A little soil is afterwards taken out of the furrows between the large beds, and scattered lightly over the seed.

The usual time of sowing onions is in the month of February, if the weather is favourable; if not as soon after as possible. Twenty pounds of seed, at the average price of four shillings per pound, is the quantity generally sown on a statute acre. Seventy or seventy-five packs, of 240lb. each, are esteemed a fair produce on an acre; the price off the field is from 10*s*. to 20*s*. per pack, according to the season. Land proper for the growth of onions lets in this district at as high a rate as 15*l*. 16*l*. or even 17*l*. per acre.*

BUCKWHEAT, RYE, &C.

In the time of Gerrard, who published his herbal in 1597, it appears that buck-wheat was "very common about Namptwich in Cheshire, where they sow it as well for food for their cattle, pullen (poultry) and such like, as to serve instead of a dunging." Very little is now sown in this county, and the produce is either ploughed in, as a manure; or mowed, for fatting swine, and poultry with the grain. Pheasants are particularly fond of the seed; and some gentlemen, who have taken pains to encourage the breed of these birds in their estates, have now and then sown it near their favourite haunts.

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* The price at which the land is let for the cultivation of onions is so much above the common average of land, that several gentlemen who saw the preceding statement were led to doubt the accuracy of it. From the doubts expressed on the subject, I was induced to repeat my enquiries; and the answers I received completely confirmed the account above given. It is even stated to me, that land has occasionally been let for 20*l*. per acre, to be applied to this purpose. *H. H.*

Rye is very little cultivated in Cheshire. It is sometimes grown upon sandy soils, and now and then mixed with wheat in different proportions.

Hemp and flax are likewise cultivated to a very trifling extent in this county. They are to be seen in the gardens of the cottager and small farmer; but only in quantity sufficient for the immediate supply of the family.

CHAP. VIII.

GRASS.

SECT. I.—NATURAL MEADOWS AND PASTURES.

THE natural meadows in Cheshire are numerous, and for the most part situated by the sides of the small streams, which intersect the county in every direction. They possess a remarkable degree of richness and fertility; a circumstance which may probably in part originate in other causes than the greater degree of moisture derived from their situation. Every overflowing of the land (and, from the great quantity of rain falling in the county, floods are very common) is accompanied with a greater or less deposition of soil, washed down from the neighbouring hills; and the frequent occurrence of this effect, during a succession of ages, has covered the surface of the vallies with an alluvial soil of great depth, and affording a remarkable luxuriance of produce. They are, on this account, peculiarly well calculated for meadow land; generally yielding very heavy crops of hay. The injury which the farmer is liable occasionally to suffer from floods, immediately before, or at the time of hay harvest, generally induces him to cut the grass, on this land, at an earlier period than is usual throughout the county.

From the great extent to which the making of cheese is carried on in Cheshire, the proportion of pasture land is very considerable; particularly in the middle and southern parts of the county. Its quality is of course varied by the nature of the soil, and other local circumstances. From the enquiries I have made of several intelligent farmers, with a view to ascertain what description of land is peculiarly suitable for a dairy pasture, I have found it to be the generally prevailing opinion, that a tolerably stiff clay soil, especially with a substratum of marl, is, upon the whole, the most favourable for this purpose:* more milk may be had from cows pastured on a rich loamy soil, but it is esteemed inferior in point of quality. This opinion is in a great measure confirmed by an actual reference to facts. The dairy farms in Namptwich, and the western part of Northwich hundred, which are, generally speaking, the finest in the county, are situated for the most part on a stiff clay land, with a strong marl below it. Throughout the greater part of Broxton hundred, which is completely a dairying district, the soil is either a strong clay, or a clayey loam; and the same observation may be extended to the hundred of Wirrall. Respecting the causes of this fact, I confess myself unable to give any decided opinion; nor indeed have I heard any satisfactory explanation of the subject: it seems probable, however, that the difference in the quality of the grasses, resulting from the difference in the soil, must be one of the principal circumstances contributing to the effect in question.

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* Farmers in Cheshire sometimes complain that their land is too rich for the dairy. The cheese certainly has its adhesive properties diminished, when the cows have been pasturing on some kinds of land, and those apparently of the best quality.

The species of grass, which are met with in Cheshire, are generally such as nature offers; or such as are produced from seed sown without any regard to selection. With the exception of the rye-grass (*Lolium perenne**), the cultivation of no other kind, as far as I have learnt, ever receives the attention of the farmer. On the good meadow lands, however, many of the best species of grass are frequent.

Smooth stalked meadow grass. (*Poa pratensis.*)

Rough stalked meadow grass. (*Poa trivialis.*)

Meadow fescue grass. (*Festuca pratensis.*)

Meadow foxtail grass. (*Alopecurus pratensis.*)

These are four of our best grasses for either meadow or pasture land, and are all common in this county. Horses, cows, and sheep are fond of them; and they are each of them very productive. In the account of the principal English grasses, given by the late ingenious Mr. Sole in the 9th Vol. of the letters and papers on Agriculture, by the Bath society, the highest rank is assigned to the Poa pratensis. Both this, and the meadow foxtail grass, are early and productive; excellent in quality; and highly deserving of cultivation.

Sweet-scented vernal grass. (*Anthoxanthum odoratum.*)

Though cattle are extremely fond of this grass, and it makes excellent hay; it may be doubtful whether it is profitable as a meadow grass. It is by no means productive; and as it flowers, and ripens its seeds much earlier than any of the other grasses, it is ill adapted to mix with them. It is common in Cheshire on sandy loams.

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* See Artificial Grasses.

Crested dog's tail grass. *(Cynosurus cristatus.)*

Cattle are fond of this; but it is a late grass, and not very productive.

Field foxtail grass. *(Alopecurus agrestis,)*

Less common than the meadow foxtail grass, and much less productive.

Rough cock's foot, or orchard grass. *(Dactylis glomerata.)*

This is one of the most frequent meadow grasses in Cheshire. It is coarse, but very productive; and is much better adapted to meadow than pasture land. It ought to be cut early.

Meadow soft grass. *(Holcus lanatus.)*

This is a very productive grass, but from its woolly nature, and its softness, not esteemed for either pasture or hay. Mr. Wilbraham informs me that he had once a field sown by mistake with this grass: it was highly productive, but his cows being fed with the hay from it immediately gave a less quantity of milk.

Tall oat grass. *(Avena elatior.)*

This is frequent on moist soils, and is a good and productive meadow grass. Where lands are in tillage, it becomes a troublesome weed from the knottiness of its roots.

Meadow cat's tail, or Timothy grass. *(Phleum pratense.)*

This, with its variety the *P. nodosum*, are common in the dairy pastures in Cheshire. It has been strongly recommended for cultivation, but seems by no means to merit the high character which was, at one time, given it. In moist lands it grows tolerably well; but on all lands it is much inferior to the meadow foxtail, or the smooth stalked meadow grass.

Annual meadow or Suffolk grass. (*Poa annua.*)

This is very common on all good loamy land; and is perhaps the best grass we have for pastures, from the rapidity with which it propagates itself, and the fondness of cattle for it.

Couch grass. (*Triticum repens.*)

This pest of the farmer is perfectly well known. In gardens, it is got rid of by forking up: in arable lands, by fallowing; frequent harrowing; collecting the roots into heaps, and burning them.

Intermixed with the grasses which have been mentioned, and with the various other grasses which are occasionally met with, many other plants are frequent in the meadows and pastures; some of which may be regarded as useful auxiliarics, others as weeds, which the farmer ought to take pains to eradicate.

Perennial clover. (*Trifolium medium.*)
Tufted vetch. (*Vicia cracca.*)

These are each perennial plants, and are highly deserving of cultivation, for either pasture or meadow land. From the abundance of seed which the vetches yield, they would be readily propagated. Both these plants are frequently found mixed with the grasses, especially in moist land.

Yellow rattle, or penny grass. (*Rhinanthus crista galli.*)

No plant is found in the meadows in Cheshire more frequently mixed with the grasses than this. The seeds are slightly bitter, and contain a good deal of saccharine matter. It is not, in general, liked by the farmer; but there seems no reason to suppose, that it may not be an useful addition to the grasses. Both horses and cattle eat it.

Meadow vetchling. (*Lathyrus pratensis.*)

This plant bears a large number of succulent leaves; and, though formerly reprobated, seems well deserving of attention as an addition to the meadow grasses. Cattle and horses eat it, and it makes good hay. It is frequent in this county.

Bird's foot trefoil. (*Lotus corniculatus.*)

Withering says that "cows and horses eat it; sheep are not fond of it;" but he adds, "in Hertfordshire, it is cultivated as pasturage for sheep." Mr. Pitt, the ingenious author of the Agricultural Report of Staffordshire, gives it as his opinion that it is worthy of cultivation. As far as my observation goes, neither cows, horses, nor sheep seem fond of it; and it cannot therefore be recommended for pastures. As a mixture with grasses in the meadow, though in moist lands it will now and then keep pace with them in growth, it does not in general attain sufficient height to be productive; otherwise, it makes good hay.

Ragged robin. (*Lychnis flos cuculi.*)

This is frequent in moist meadows in Cheshire.

Butter flower. (*Ranunculus acris.*)

This abounds in many of the moist meadows and pastures, especially in clayey soils. Both horses and cows refuse it in pasture lands; and though it in a great degree loses its acrimony in drying, it cannot be considered as a desirable addition to meadow grasses.

Common sorrel. (*Rumex acetosa.*)

Curled dock. (*Rumex crispus.*)

These are each frequent in meadows and pastures; the latter in cultivated land, where it is refused both by horses and cattle, and too much pains cannot be taken to destroy it. This is to be effected by drawing it up by the roots; or by cutting through the stem, below the surface of the ground; repeating the operation when it again throws up shoots.

Cow weed. (*Chærophyllum sylvestre.*)

Frequent in meadows. As it flowers, and ripens its seeds before the grasses, it is a bad addition to meadow grasses. In pastures, cows are fond of it.

Yarrow. (*Achillea millefolium.*)

This is frequent in meadows and pastures in Cheshire; and is neither disliked by the farmer, nor regarded as particularly useful. No attention is paid to its propagation.

Ragwort. (*Senecio Jacobæa.*)

Cows and horses refuse this; sheep will eat it only when very young; and it may be regarded as worse than useless, both in meadows and pastures. It frequents only rich soils; and the farmer often exhibits the keddle-dock, as it is called in Cheshire, as a proof of the goodness of his land. Whilst his vanity is flattered by its presence, he not only neglects to extirpate it, but often suffers it to spread over one of his best pieces of land, to the injury of himself, and the annoyance of his neighbour. By mowing, it is prevented from propagating its seeds; but the roots are not destroyed. This is best effected either by eating it down while young with sheep, or pulling it up by the hand. This last should be done when the ground is moist, that no considerable fibres may be left; if there are, the roots will strike again.

Way thistle. (*Serratula arvensis.*)

This is a perennial plant, with strong roots branching out horizontally. Curtis says, repeated mowing will weaken it, if not effectually overcome it. The best time of mowing it is when it is getting into full bloom; as the rain water then passes down its hollow stem, and assists in rotting it. In arable land, frequent and deep ploughing destroys it: in pastures, it is best got rid of by pulling it up when the ground is wet.

Spear or bur thistle. (*Carduus lanceolatus.*)

As this is a biennial plant, it is easily destroyed by taking care to mow it down before it has perfected its seeds.

Knapweed. (*Centaurea nigra.*)

This is frequent in the cold meadows and pastures in this county. It is a coarse hard plant, which cattle dislike either green or in hay. It is perennial; and is extirpated only by fallowing, or pulling up by the roots.

Cockle. (*Agrostemma githago.*)
Corn poppy. (*Papaver rhœas.*)
Ox-eye, or great daisy. (*Chrysanthemum leucanthemum.*)
Corn marigold. (*Chrysanthemum segetum.*)
Corn camomile. (*Anthemis arvensis.*)
Rape, or cole seed. (*Brassica napus.*)
Charlock, or wild mustard. (*Sinapis arvensis.*)

The seven last-mentioned are the weeds most frequent, and most prejudicial, in corn-fields in Cheshire. Most of them are very prolific of seeds; and if these are allowed to be ripened and shed, the farmer has long to lament the consequences of his neglect.

Colt's foot. (*Tussilago farfara.*)

Where land has been hard tilled, this plant is generally found in great abundance. It is most effectually de stroyed by summer fallowing, and by giving the lan rest.

Ladies' mantle. (*Alchemilla vulgaris.*)
Cow parsnip. (*Heracleum sphondylium.*)

Mead

Meadow sweet. (*Spiræa ulmaria.*)

Bistort. (*Polygonum bistorta.*)

Each of these four plants is frequently met with, especially in moist meadows. They can none of them be regarded as useful additions. It may deserve enquiry, whether the strongly astringent root of the bistort might not be advantageously applied to other than medical purposes.

We find several species of *carex* and *juncus* frequent in the cold clayey meadows and pastures; from which the land can be freed only by draining, and by ridding it of its superfluous moisture. To enumerate the other plants, intermixed with the grasses, would only be to give a catalogue of the indigenous plants of the county; those which have been mentioned are of most importance in an agricultural point of view.

A few of the rarer plants it may not be improper to notice. Of these the first place is due to the

Marsh saxifrage. (*Saxifraga hirculus.*)

This is found on a low swampy piece of ground, about a quarter of a mile from Knutsford. The soil in which it grows is a bog earth, with clay, and a little sand mixed with it; and, in the dryest season, this earth is kept perfectly moist, by a small stream which filters through it. The plot of ground on which it is met with does not exceed fifty yards square. With the exception of some rare situations in Westmoreland, this plant is, I believe, found native in no other part of the kingdom.* On the same ground we meet with Marsh cinquefoil. (*Comarum palustre.*) Buckbean. (*Menyanthes trifoliata.*) Early orchis. (*Orchis mas-*

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* Some dried specimens were shewn me by J. T. Stanley, Esq. which he had found in Iceland.

cula.) Common tway-blade. (*Ophrys ovata.*) Nodding double tooth. (*Bidens cernua.*) Cranberry. (*Vaccinium oxycoccos.*) Brook-lime. (*Veronica becabunga.*) Marsh louse-wort. (*Pedicularis sylvestris.*) Marsh marigold. (*Caltha palustris.*)

The other plants less frequently met with are

Water gladiole. (*Butomus umbellatus.*) In Budworth mere.

Wall cabbage. (*Brassica muralis.*) On Chester walls.

Water feather foil. (*Hottonia palustris.*) Wet ditches near Latchford.

Navel-wort. (*Cotyledon umbilicus.*) Rock-savage.

Frog-bit. (*Hydrocharis morsus ranæ.*) In ponds near Groppenhall.

Bitter vetch. (*Orobus sylvaticus.*) Vale-royal woods. Banks of the Bollin.

Water bennet. (*Geum rivale.*) Near Davies Davenport's, Esq. at Capesthorne.

Dusky crane's bill. (*Geranium phæum.*) Moist meadows in Ashley.

Herb Paris. (*Paris quadrifolia.*) The woods of Sir J. F. Leicester, Bart. in Tabley.

Middle flea-bane. (*Inula dysenterica.*) Near G. Leycester's, Esq. at Toft.

Greater bladder snout. (*Utricularia vulgaris.*) Ponds in Mobberley.

Fresh water soldier. (*Stratiotes aloides.*) Ponds in Tabley.

Broom rape. (*Orobanche major.*) Near Hill-cliff.

SECT. II.—ARTIFICIAL GRASSES.

Red Clover, or Honeysuckle Trefoil. (*Trifolium pratense.*)

This plant has been long cultivated in Holland and Flanders. On its first introduction into this island, a very strong prejudice existed against it, which was with difficulty surmounted. We cannot however now ask the question, as at the end of the seventeenth century, "what is the reason why the great advantage got in Staffordshire and Worcestershire by sowing of clover, can scarce prevail with any in Cheshire or Lancashire to sow a handful upon the same sort of land?"* None of the plants called artificial grasses are at this time so much cultivated in Cheshire; and it is deservedly held in high estimation. "It is the principal seed with which the farmer lays down his tillage land for pasture."† "Eight or ten pounds per acre is the quantity usually sown; which is perfectly sufficient if the seed is good, and the land suitable for it."‡ In a few rare instances, the seed has been gathered; but the climate of this county is ill adapted to the ripening of it. It is usually mown for hay, or cut as green food for horses.

White Clover. (*Trifolium repens.*) "About half the quantity of white clover is usually sown with the red clover, if the ground is worked fine to receive it."‖ "There is however but little land that will suit the white clover; it requires a deep free soil, to bring it to any degree of luxuriance."*

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* Houghton's Collections, Vol. IV. p. 59.

† Mr. Fenna.

‡ I. Potts, Esq.

‖ I. Potts, Esq.

Ray or Rye grass. (*Lolium perenne.*)

"From a bushel to a bushel and a half of this, per acre, is frequently sown, with eight or ten pounds of red clover seed. It is most sown in stiff clayey soils, in which clover is apt to fail in coming up. Our dairy-men do not esteem it a good grass for producing milk, and it is therefore less generally cultivated in this county." † The advantages derived from its being an early grass, have however brought it into esteem with many. Mr. Fenna says, that on almost any soil it will be a pasture a week or ten days sooner than any other kind. He adds that it corrects the tendency of clover to produce flatulency; and on that account is well worthy of attention. Messrs. Remers inform me that a good deal of it is sown in Cheshire; and that a light soil is quite as suitable for it as a clayey one. This is not in opposition to Mr. Potts's statement, that it is most sown in stiff clayey soils; not however from the idea that lighter soils are less adapted to it, but that the land may be occupied by this, should the crop of clover fail from the stiffness of the soil.

When rye grass is sown with clover, it is usually cut for hay (*see the article hay-making*); and it is one of those grasses which it is particularly desirable to cut early, otherwise the produce is scarcely so nutritious as straw.

Rye grass is also sometimes sown by itself. The quantity of seed which this plant yields, and the ease with which it is collected, have probably been amongst the reasons why the seeds of this grass are more generally offered to sale than any other; while the advantages derived from its throwing up its shoots earlier than most of the other grasses have led to its more frequent cultivation. Several of the grasses, however, as the vernal, the foxtail, the meadow poa, &c. are quite as early as the rye grass; while the meadow fescue, the oat grass, and some others, appear to be at least as well deserving of attention.

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* Mr. Fenna. † I. Potts, Esq.

Hop Medick or Trefoil. (*Medicago lupulina.*)

Mr. Fenna says, "this is sometimes sown by itself, but is not in much estimation. A small quantity is often sown with red clover; probably with advantage, as a preventative of the swelling of cattle." Messrs Remers also inform me that trefoil is often mixed with clover, with the view of preventing the swelling of cattle.*

Ribwort Plaintain, or Rib-grass. (*Plantago lanceolata.*)

Three or four pounds to the acre of the seed of this plant are not unfrequently mixed with clover and trefoil, or with grass seeds. Some farmers are fond of it; others have informed me that they thought its place would be better supplied by some other of the grasses. Near Sandbach, I remarked some fields which had been sown with it, with scarcely any admixture of grass seeds. Mr. Dickenson mentions that "twelve acres being sown with it, a plentiful crop was produced, but no animal would eat it." * From what I have seen, I should think his report not very distant from the truth.

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* In several instances which have come to my knowledge of cattle being "blown" by eating clover and other flatulent plants, the use of the flexible tube, sold by Mac Dougale, Oxford-street, London, has been found a speedy and effectual remedy. As it is not expensive, is easy in its application, and is much less hazardous than the rude mode commonly practised of stabbing through the coverings of the abdomen into the intestines, every large dairy farmer ought to be furnished with this instrument.

An instrument of the same construction, but of smaller dimensions, is applicable to sheep labouring under the same complaint. I have not however heard of any instances in which it has been employed, though some farmers are in possession of it.

Since writing the above, I observe Mr. Pitt, in his excellent report of Staffordshire, says, "There is good authority for asserting that cattle will not eat its leaves alone; but it is believed to be a grateful mixture with other herbage."

Saintfoin. (*Hedysarum onobrychis.*)

This grass is very little cultivated in Cheshire: Ray says it furnishes abundance of milk. It grows best, I believe, on a dry chalky soil, which is not the soil of this county.

Lucerne. (*Medicago sativa.*)

In a very few instances, trial has been made of lucerne in this county; but, either from the soil not suiting it, or the management not being proper, the result has not been such as to lead to an extension of its cultivation. Mr. Fenna says, that in deep and good soils, it has now and then turned out very heavy crops of fodder; and has been mown thrice in the year; but it does not promise to be serviceable in general use.

Vetches or Tares. (*Vicia sativa.*)

These are a good deal cultivated in Cheshire. They are distinguished into two kinds, the *winter* and the *spring* vetch. Each of these seems to be a variety of the common vetch, or the *vicia sativa* of Linnæus. A small difference appears in the seeds of the two kinds, which some farmers tell me they are able to distinguish; others say that they cannot. The author of the Synopsis of Husbandry remarks that "the seeds of the winter and spring tare are not easily discriminated, being nearly alike in size, and every other characteristic; but, on the appearance of the blade, the difference is at once to be perceived. The winter tare vegetates with a seed leaf of a fresh green colour; whereas the spring tare comes up with a grassy spear of a brown dusky hue."

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* Withering's botanical arrangement.

Though so nearly resembling each other in external appearance and in their botanical structure, the habits of the two plants seem to be very different; the one cannot support the cold of winter, the other is exposed to its utmost severity without injury. It therefore becomes an object of much importance to the farmer to discover some distinguishing mark of the two plants from their outward appearances. Unless that given by the author of the Synopsis of Husbandry be an accurate distinction, I confess, I do not know of any; and till some certain means of discriminating these two varieties be established, it is only by collecting the seed from the produce of his own land, that the farmer can with certainty avoid disappointment in his future produce.

Both the spring, and winter vetches are principally mown for the stall feeding of horses, and cattle: when the crops of meadow grass are less abundant than usual, the spring vetches are, now and then, made into hay. This I have found to be the case, in several parts of the county, in the present year, 1806. The winter vetches are almost entirely used for stall feeding. A very intelligent agriculturist in the county has mentioned to me, that he has been in the habit, for two or three years, of sowing a small plot of ground with winter vetches and rye, in August, after grazing the land till that time.* The produce has been ready to cut the latter end of April, or the first week in May; and by giving this as stall fodder to his cattle at that period, he has not only been enabled to have them in better condition, but to give a stronger head of grass to his pasture lands, by keeping his cattle out of them a week or ten days longer than is the usual custom. The land has been afterwards prepared for turnips, or fallowed for wheat. The advantages of this practice seem to be well worthy of consideration.

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* J. Ford, Esq. of Abbey Field.

Mr. Holland of Sandlebridge remarks, that the best time for sowing winter vetches is in the month of September; which gives the farmer sufficient time to prepare his land properly for a crop of wheat and turnips the ensuing season. He informs me too, that he has got this year an excellent crop of turnips after winter vetches.

SECT. III.—HAY-MAKING.

Clover and rye grass, which are the artificial grasses most cultivated for hay in Cheshire, are frequently cut as early as the middle of June; whilst the natural meadow grasses are seldom cut in this county before the middle or latter end of July; and it is not uncommon to see many farmers in their hay harvest as late as the third or fourth week in August. Anxious to procure as large a crop of hay as possible, the farmer is too often induced to delay the mowing of his grass much longer than he would do, if he duly considered his own interest. While the flowering stems are shooting up, and during the whole process of fructification, every species of grass, but especially the Poas and Festucas, abounds with saccharine matter: this is found particularly in the joints of the grasses, where, according to the idea of the late ingenious Dr. Darwin, a secretion of sugar takes place;[*] and it is probable that from this source the subsequent nutriment afforded by the plant is, in great measure, derived. As the seeds approach to maturity, this sugar is found in less abundance; and when they are completely ripe, the object of nature being attained, the flowering stem and radical leaves begin to decay, and an absolute *caput mortuum* is soon left. It appears too that the fermentation, or *sweating* as it is called, of hay in the stack or barn, has the effect of communicating a flavour to it, which renders it much more palatable to the horses and cattle which are fed upon it, than such as has never gone through that process. On this account, every circumstance tending to increase the fermentation to a degree which may not endanger the firing of the hay, or the rendering it excessively mow burnt, is an object worthy the attention of the farmer; who will therefore act judiciously in cutting his grass, before the stems have lost that saccharine matter, with which during the process of fructification they are filled, and which is undoubtedly the immediate cause of the subsequent *sweating* of the hay. For the same reason the grass, especially that produced on a poor soil, should not, in the process of hay-making, be too long exposed to the action of the sun and air: otherwise the juices are dried up, and the hay rendered less palatable and nutritious to the cattle fed upon it.

The proper time of cutting the meadow grasses seems then to be when the saccharine contents of the various grasses are in the greatest abundance. This appears to be when the seed is formed, but before it has arrived at maturity. If the grass is allowed to grow till the seed is completely ripe, not only the most nutritive part of the vegetable is lost, but the land is much more exhausted than it would have been had it been cut earlier. At the same time the best season for getting the hay is passed over; the plants are become withered at the bottom of their stems; the roots are decayed; and the crop of after grass is materially lessened in quantity.

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[*] See Darwin's Phytologia, page 77.

These remarks may suggest the advantage of having, in the same meadow, those grasses which ripen their seeds as nearly as possible at the same time. Such a selection there may be some difficulty in making; and yet, with proper attention, there can be no doubt but it might be effected. The nature of the soil which each particular grass loves to frequent, should at the same time be taken into consideration; and the application of the individual kinds adapted, if possible, to this circumstance. So far, in general, is the farmer from paying any attention to this subject; that when he is in want of grass seeds, he takes them, without any discrimination, from the bottom of his own, or his neighbour's mow; and too rarely considers of what species of grass they are the seeds, from what land they have been procured, or whether they are adapted to the land on which they are to be sown. If they are hay seeds, he is satisfied.

Process of hay-making in Cheshire.—It does not appear that there is any thing very peculiar to state on this subject. When the weather is favourable, as soon as the grass is mown, the swath is opened with forks, and spread over the whole surface of the meadow. This is called *tedding*. In this state it is allowed to remain till the succeeding day; when the upper surface of it, (fine weather still continuing) is become brown, and in some degree withered. It is then turned over with rakes; and when considered sufficiently dried or made; it is thrown together with forks into long rows, called wind rows, containing the produce of 16 or 18 yards wide. If no unfavourable weather intervene, it is raked close and clean to the row, and carried thence, without any further process, to the stack or building.

The above is the shortest and least expensive mode of hay-making. When the weather is variable and uncertain, a state of weather to which this county is particularly subject, a less direct process becomes necessary; and the general object of the plan pursued is, to dry the grass, and convert it into hay, with less exposure to the air and weather; forming it first into small heaps, and gradually increasing the size of these, as opportunities of drying and getting it occur. After the grass has been mown, it is often left in the swath for two or three days; when, if the weather continues rainy, it is turned over with the rake, to prevent its lower surface becoming yellow and decayed; and the first favourable opportunity is afterwards taken for tedding it. When it is dried after tedding, it is turned over, brought into rows with the rake, and then *coiled;* which part of the process consists in collecting together from the row, and turning over at the same time, as much of the grass as is taken up with two sweeps of the rake. From the coil, as the weather permits, it is either simply turned over, or it is again opened, and afterwards, with the rake and fork, formed into small round heaps, called small cocks. These, on the succeeding day, are shook open and spread; if necessary, again turned; and afterwards either formed into wind-rows as before, or collected into larger heaps or cocks, from which the hay is carried away, after drying any portion of it which may have been exposed to the weather.

The management of clover and rye grass, and particularly of clover alone, after mowing, is somewhat different to that of the meadow grasses. "This is not opened after mowing; but the swath is turned over, with forks, till it is considered sufficiently dry to be got together and carried from the field."* Such is the practice in many parts of the county. In others however, if the weather is fine, the clover is spread abroad from the swath immediately after mowing; care being taken not to expose it too long in this state to the action of the sun and air, so that the drying process may not be carried too far. The less too it is raked, or moved about, after the leaves are withered, the better practice it is considered; since both the leaves and flowering heads will then drop from the stem, and much loss be sustained in the loading and stacking. In the neighbourhood of towns, where the land is in high condition, a second crop of clover is occasionally mown; but this is not the usual practice, and the tenant is generally restricted from it.

From what has been said concerning the saccharine secretions of the grasses and the subsequent fermentation of the hay, it will appear that not only the grasses may be allowed to grow too long, but that, in getting, the drying process may either be too far continued, or may not be carried far enough; in other words, that the hay may be too much, or too little got. A certain proportion of moisture is necessary to produce the fermentation of the saccharine part of the vegetable;

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* Mr. Fenna.

which fermentation, if not carried to excess, tends materially to the improvement of the hay. The grass may be so long exposed to the action of the sun and air, and so much dried, that this moisture is completely evaporated, and no subsequent fermentation can take place: or, on the other hand, it may be too little dried, and either the hay in consequence become mouldy; or, where the saccharine contents are considerable, too violent a fermentation may ensue, and the hay be mow burnt, or even take fire. The last is the most frequent error of the farmer. In fine sunny weather he is too apt to be deceived by the withered appearance of the grass: he finds it dried on the surface, and even crackling in the hand, and supposes it made: but the evaporation from it has been only external; when heaped together in the stack or the mow, the fermentation is much greater than it ought to be; and the consequent heat either burns, or sets fire to the hay.* We accordingly almost invariably find that when a stack of hay takes fire, it has been got and put together without rain; and that this is an accident scarcely ever occurring to hay that has been weathered. The greater the quantity of sugar in the grasses; which will be varied by the soil, the nature of the grasses, and the period of their growth; the more necessary it is to take care that they are not too little dried: for in proportion to this quantity, *cæteris paribus*, will be the subsequent fermentation.

The question as to the comparative advantages of making use of open stacks, or covered sheds or buildings for keeping hay, has been one of frequent discussion, and each of these modes still has its respective advocates. All the arguments on this subject appear to have reference either to the convenience and expense of getting in the hay, or to its subsequent preservation. It is allowed by both parties that when the building is actually erected, greater convenience is afforded, especially in variable weather, of getting in the hay; and that the covering which the shed supplies enables the farmer to do this in a shorter time, at smaller expense, and with less injury to the hay, than when he has to form a stack in the open air. Again, when the hay is got in, nothing further is wanted; and the losses and expenses from pulling the sides of the stack, and thatching it, are all completely saved. So far every advantage appears in favour of the covered buildings. The advocate for the open stack on the other hand contends, that the additional expense incurred in forming a stack, and afterwards thatching it, is little, if at all, more than the interest of the sum expended in the erection of a shed; while the better preservation of the hay in the stack more than compensates for any disadvantages attendant, in the first instance, on the stacking.

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* See Middleton's excellent view of the agriculture of Middlesex, p. 244.

Mr. Middleton, whose opinion certainly carries great weight with it, is decidedly in favour of barns or covered sheds; and he does not allow even that hay keeps better in an open stack than it does in these buildings; as, in securing hay in his barn without clearing it from the quartering on the sides, he found, on cutting and binding it up, that it was equally good in quality with that from the stack yard, and as perfectly free from dust. Of the accuracy of Mr. Middleton's report, with respect to his own hay, there can be no doubt entertained; but it is certainly in opposition to every account I have received from the different farmers I have consulted on the subject, as well as to the observations I have myself had the opportunity of making. Whenever hay has been put together in a close barn or shed, it has been, almost invariably, found mouldy and dusty, in every part which has come into contact with the brick walls of the building. We cannot be surprized at this if we consider the natural effect of the *sweating* of the hay. The heat produced by the fermentation of the saccharine contents of the hay will be greatest in the centre of it, in whatever manner or situation it is put together: the aqueous parts will in consequence be evaporated from thence, and will be thrown to the surface. If nothing occurs to obstruct them there, they will pass off in the form of vapour: but if such an obstacle as a brick wall is opposed to them, they will necessarily be detained; and as the fermentation is lessened, and the heat subsides, will be condensed in that portion of the hay most distant from the centre; producing in it the same effects as if the hay had been put together wet, that mouldiness which is so frequently met with under these circumstances.

The advantages then of buildings for the preservation of hay seem chiefly to consist in the covering they afford. By means of this, the labour and expense of thatching is saved, and every convenience is given of getting the hay well together. So far as the sides of any building occasion obstruction to the free evaporation of the watery contents of the hay during its fermentation, they are undoubtedly hurtful; and the most useful sheds are those raised on pillars or posts, open on all the sides; especially if the covering which these support is a moveable one, and capable of being raised or depressed at pleasure, so as to enable the farmer to guard at all times the upper surface of the stack from the weather.

In many of the modern sheds in Cheshire, which have been bricked at the sides, it has been usual, in building the wall, to leave out every alternate brick; which lessens, to a certain extent, the evils of a close shed; and allows at least a part of the water of the hay to escape during the sweating process. To have the sides planked up, would be still less injurious to the hay, as the aqueous vapour would then more freely pass through.

In erecting in Cheshire any shed, or any building open at the sides, for the keeping of hay, regard should be had to the prevalence of westerly winds in this county, and to their being so frequently accompanied with rain. These circumstances point out the propriety of having the building sheltered from the west; or of placing it in a direction from west to east, so as to avoid, as much as possible, exposure to the weather.

SECTION IV.—FEEDING.

THE dairy constituting the principal object of attention to the Cheshire farmer, the feeding of cattle is very little practised in this county; and consequently nothing peculiarly worthy of notice occurs on this subject. Some few farms in different parts of the county are held for the purpose of feeding; and it is a general practice with the occupiers of the larger farms, of from one to three or four hundred acres, to reserve a few acres of their aftergrass for feeding one or more of the refuse of their stock, or such as do not promise to be profitable for the next year's dairy. One of these is generally killed at Christmas for the family, part of it being salted, dried, and kept for the use of the succeeding year. Much the greater part of the refuse stock, however, is driven to the markets in the south of Lancashire; or sold at the Michaelmas and spring fairs, and carried off to some of the feeding counties nearer the metropolis.

For an account of the feeding of sheep in this county, see the article *Sheep*.

important of which seems to have been, the want of attention to the propagation of new species, when the old trees have gone to decay: the place of these has, generally, been supplied by young plants grafted from the old stock, and consequently partaking, as has been shewn by Mr. Knight, in his ingenious treatise on the culture of the apple and pear tree, of all the diseases to which the parent trees were subject. A few new sorts, produced from seedling plants, have, however, within these few years been introduced, which are healthy, and promise to be much more productive than the grafts from the old trees.

Another cause of the diminished number of fruit trees may be traced to the increase in the value of every other species of agricultural produce. Sensible of the advantage to be derived from the propagation of fruit trees, the farmer sometimes plants them, and pleases himself with the hope of the future profit they will afford him. A long period, however, must elapse, before they can be expected to make him any return: in the mean time, that he may not lose a blade of grass in his orchard, he, in an evil hour, turns in his cattle; which, browsing the young shoots, and rubbing off the bark of the trees, destroy in a few days the growth of years. If it is the interest of the farmer to plant fruit trees at all, it must be equally so to keep them well fenced out; and to prevent the access of his cattle to them, till they have attained sufficient size not to be materially injured by such an exposure.

beneficial effects to a class of society, whose comforts ought to constitute an object of general attention. The cottager, at the expense of little labour, is enabled to procure from his garden a cheap supply of vegetables for the use of his family; while an additional inducement is by this means held out to him to spend his evenings at home, instead of idling them away at the public house, in dissipation and drunkenness.—*See the article on Cottages.*

All the varieties of raspberries, currants, strawberries and gooseberries, are to be met with in the farm and cottage gardens in Cheshire. The culture of the latter fruit, has been particularly attended to of late years; and there are several meetings in different parts of the county, where small premiums are adjudged to those who produce, out of their own gardens, gooseberries of the greatest weight. The common fruit trees, such as the apple, pear, cherry and plumb, are likewise grown in almost every garden. Of the latter kind, the damascene plumb is by much the most common; and is an article of considerable profit to the cottager.

Orchards.—The orchards in this county are by no means numerous; nor is there, in general, so much attention paid to them, as might be expected from the vicinity of the great markets in the south of Lancashire. It does not appear that there is any thing in the soil or climate of Cheshire unfavourable to the growth of fruit trees; since I have been repeatedly informed, that, fifty years ago, both apple and pear trees were more numerous, and gave a more abundant produce than they now do. Several circumstances have, however, occurred to occasion this decrease in the number of trees, and the diminution of produce; one of the most ford and Warrington, at Dunham Massey, are the most considerable in the county. The oaks here have attained a very unusual size. Individual trees of greater magnitude may be found in various parts of the kingdom; but few spots in the island, certainly none in this county, can boast such an assemblage of stately oaks, as ornament one part of the park, raising their venerable heads above the rest of the forest trees. Those of an inferior size, in the same park, are numerous, and many of them promise to become very fine timber. The magnitude of the elms and beeches, is likewise a striking feature in the woods at Dunham. Of the early history of the large oaks, I have not been able to obtain any accurate account. From some deeds, in the possession of the noble owner, it appears, that, above two hundred years ago, they are mentioned as the trees in the *old* wood.* During a violent storm of wind, on the 21st of January 1802, one of these immense oaks (the fourth or fifth only in point of size) shared the fate of several hundred small trees, and was torn up by the roots. The measurement of it, over the bark, was 481 feet: after the bark had been stripped off, it was found to contain 403 feet of timber. It appeared that it had lost its tap-root, having been supported entirely by the roots which had shot out in a lateral direction: the trunk, however, was so perfectly sound, and the timber was considered so valuable for the purposes of a mill-shaft, that 373½ feet of it were sold, to be applied to this use, at 6*s.* 6*d.* per foot, or for 121*l.* 7*s.* 9*d.* An elm, which was blown down at the same time, measured 146 feet, and was sold for 36*l.* 10*s.* at the rate of 5*s.* per foot.*

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* In a small work published in 1763, entitled, "Heart of Oak, the British Bulwark," the object of which is, to shew the great decrease of timber in the kingdom, and the necessity of immediate planting, I find the following curious remarks on the woods at Dunham.

"Another instance worthy to be produced, and more worthy to be imitated, is that of the late Earl of Warrington, at his seat at Dunham Massey, in Cheshire: not less than one hundred thousand oaks, elms, and beech, left upon record, shew the patriot spirit he was possessed of. And when he was blamed by some of his colleagues in power and ability, for squandering away so much money, and destroying so much land, which he would never live to enjoy the benefit of, his answer was, Gentlemen, you may think it strange that I do these things; but I have the inward satisfaction in my own breast, the benefit of posterity; and my survivors will receive more than double the profit, than by any other method I could possibly take for their interest."

Adjoining the park in which these trees grow is another extensive enclosure, called the new park, which likewise contains a very considerable number of different sorts of trees, but chiefly oaks. These were planted about 60 years ago by the late Earl of Warrington; but on a large portion of the ground, which has a very dry sandy bottom, the oaks have not made much progress: on other parts, the situation of which is lower, and more moist, their appearance is promising.

In the woods at Alderley Park, the seat of J. T. Stanley, Esq., the size, and beauty of the beeches, forms a striking and predominant feature. These venerable trees were planted about a hundred and fifty years ago. The trunks of many of them rise to the height of twenty feet, before they divide into branches; and measure four yards in circumference, from the surface of the ground to this height. The following is an estimate of the number of solid feet of timber contained in ten of the largest trees.

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* A colony of herons had, for ages, fixed their residence on the summits of the lofty oaks in Dunham park. After the violent hurricane in January 1802, which tore up one of their favourite trees, and occasioned great devastation among the branches of several others, they retreated to a neighbouring grove of beeches, where they have ever since enjoyed a secure abode.

	Feet in the trunk.	Feet in the branches.	Total of feet.
1 Beech contains - - -	90	86	176
2 - - - - - - - - - -			300
3 - - - - - - - - - -	150	100	250
4 - - - - - - - - - -			257
5 - - - - - - - - - -	170	103	273
6 - - - - - - - - - -	192	128	320
7 - - - - - - - - - -			260
8 - - - - - - - - - -	151	150	301
9 - - - - - - - - - -	140	210	350
10 - - - - - - - - - -			250

Upon the grounds and estate of Lord Grosvenor at Eaton, there is a great quantity of fine timber, to which this nobleman is adding by numerous plantations. The estate of Lord Cholmondeley likewise contains a large quantity of well grown timber, and plantations of considerable extent. Indeed, it may be generally remarked of the parks and grounds connected with the mansions of landed proprietors in Cheshire, that they are well stocked with timber of various descriptions; a large proportion of which has arrived at a state of maturity.

The most extensive plantation in the county is that at Taxall, on the borders of Derbyshire; the property of Francis Jodrell, Esq., of Henbury. This plantation, which occupies not less than a thousand acres of land, was begun ten or twelve years ago, by the late Foster

Bower, Esq., and completed by its present possessor.* It is at present, I believe, in a vigorous and flourishing state; and bids fair to become at once an ornament and advantage to the country.

The next most considerable plantation in the county with which I am acquainted, is that on Delamere forest, belonging to Nicholas Ashton, Esq., for the planting of which a gold medal was adjudged to that gentleman, by the Society for the Encouragement of Arts. A particular account of this plantation was given in the Transactions of the Society, A. D. 1801. From ancient records, it appears certain that Delamere forest, at some former period, produced much valuable timber; all of which is now destroyed. This circumstance induced Mr. Ashton to suppose that, under proper attention and management, another valuable crop of timber might be raised, on a district which now produced nothing but heath, affording a scanty subsistence to a few sheep and rabbits. In the summer of 1795, he enclosed one hundred and thirty-three acres, in two lots, and surrounded this plot of land with posts and double railing, with a ditch and copse. These enclosures he planted, in the months of November and December, of the same year, with 477,040 trees, chiefly Scotch firs and larches; but with a considerable intermixture of oaks, beeches, sycamores and other forest trees.

The soil, in almost every part of Delamere forest, is exceedingly thin, and, under it, is a great depth of sand intermixed with gravel. On this account Messrs. Dicksons (the nurserymen employed by Mr. Ashton) were of opinion, that it would be most advisable not to plough the land, but, after burning the heath at the close of summer, to plant the trees that were small near the surface, expecting that they would flourish more than if planted in the sand. This however proved not to be the case, for the matted roots of the heath were, the first year, detrimental to the young plants; whereas, those which had been planted on sand beds, from which the gravel had been screened, took root immediately, and are easily distinguished from the rest of the plantation by their more vigorous growth.

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* A gentleman, of the name of White, contracted to find plants, and to plant the whole of this land, at 5*l.* per acre; it being made one of the articles of the agreement, that half the trees planted should be firs

By the certificate annexed to the account of this plantation, given in the Transactions of the Society for the Encouragement of Arts, it appears that, in October, 1800, the trees were in a flourishing state; not one twelfth part of them having perished. The same report may, I believe, be extended with little variation to the present year; the plantation still continuing to exhibit an appearance highly flourishing; and more especially the trees of the fir tribe.

The spirited example of Mr. Ashton, and the success of his undertaking, have induced several other landed proprietors in the county to plant upon similar soils. Indeed from the serious diminution in the quantity of timber, and especially of oak timber, which has taken place of late years, the vigorous prosecution of some measures for the production of a future supply is become indispensably necessary to the continuance of this valuable article in Cheshire.* The axe is daily applied to the roots, not merely of those oaks which have attained their full perfection of growth, but to young and thriving trees; which, had they been permitted to stand forty or fifty years longer, would at least have doubled their quantity of timber. Nor is this merely a temporary evil. The demands, both for the timber and bark of the oak, are of a constant nature;

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* "In fifty years, if timber continues to be cut down every year in the same proportion it has been for the last ten years, there will scarcely be a single oak tree left in the county. Oak timber is selling this year (1806)

(1806) at the prices of 4*s*. 5*s*. and even 6*s*. per foot; and 14*l*. a ton has been paid for bark. If statesmen thought it their duty to provide for the future safety and glory of the country, they should make some sacrifice of present revenue to secure the continued existence of a navy. There will be no planting, on a great scale, until it is made the interest of men to do so. If for one or more acres covered with a given number of thriving oak plants, the owner was to be exempted from the operation of certain taxes; if, for instance, his house was to be exempted from the window tax; or he was to be allowed the free use of bricks, to be employed upon his own land; or some gratification and exemption, equal to the good he did his country, new forests would soon spread themselves over the kingdom, and become a security for its future safety and prosperity. The value of the land given up to planting should be considered in the apportionment of the indulgence.

"No rewards that societies can offer will ever produce much effect. Interest must operate to make a practice general, and the interests of the state, and of the individual, should be made in this instance to go hand in hand. We pay heavy taxes now, that the national debt may be extinguished fifty years hence; why should not taxes be paid now, that the navy may exist a hundred years hence? An acorn of the present year may, in a century, furnish ribs for a seventy-four gun ship: let the public then buy, and plant the acorn. It would do so, in taking on itself the payment of a tax, to which the planter would otherwise be liable. The new trees might be valued from time to time, if it should be found necessary to guard against imposition; the existence and growth of the wood should be the operating causes of the exemptions allowed, and inspectors might as easily examine into this, as count windows.

"In short the state must interfere, if the state thinks it an object to secure the continuance of a navy. If politicians are satisfied that things should last their time, all is very well: the kingdom has yet some oaks left." *J. T. S.*

ture; and unless new sources of supply are laid open, this part of the kingdom must, ere long, be wholly destitute of both these articles. It becomes then an object of the highest importance, in a national point of view, that every possible encouragement should be given to planting. Large tracts of waste land are to be met with in every part of the country, which might, with a little attention and management, be rendered subservient to this purpose. The grand obstacle, however, appears to be here, as in so many other cases, that the expense is immediate; the profit at a distance. This objection might, in some degree at least, be obviated by the consideration that, as it is the natural desire of every individual to make a suitable provision for his descendants, this object can by no means be more effectually attained than by planting. If the land devoted to this purpose has previously been in an uncultivated state, the capital expended is comparatively trifling; while the security of the speculation, and the almost absolute certainty of very large future profit as its result, are such as to give it a decided superiority over various others, which men undertake with a view of providing for their children. But, throwing all regard to posterity out of the question, a man, if he begins to plant early, and with quick growing trees, may himself live to reap the most substantial advantages from this mode of occupying his land. The public benefit, too, done to the country, though it must ever constitute a motive of inferior weight to individual interest, yet, if more generally considered in combination with the latter, might perhaps operate as an additional inducement to the planting of timber throughout the kingdom.

Considering this subject with a more immediate reference to Cheshire, it must be observed that there are a number of situations in this county, where the land could not be more beneficially occupied than in planting. The success of Mr. Ashton's plantations has shewn that a very considerable portion at least of Delamere forest is perfectly well adapted to the growth of timber, of various descriptions. Many situations of a similar nature are to be met with, where an equal degree of success would, in all probability, be the result. By the sides of brooks, and on low swampy ground, the willow and the alder might be planted with the greatest advantage to the proprietor. Mr. Holland of Sandlebridge has made the following communication on this subject.

"Upon certain situations, the Huntingdon willow is in my opinion more beneficial to the planter, than any other kind of tree. This is a consequence of its extreme rapidity of growth. I have at present two willows of this description which were planted 29 years ago, and which now contain not less than 40 feet of timber apiece. This at 2*s*. a foot will give 4*l*. as the value of each of the trees, independently of the bark, which I understand has of late been used in the tanning of sheep skins and other light goods, and is purchased by some tanners in the county at the rate of 5*l*. per ton, when peeled. The growth of these willows, however, can by no means be considered as a fair average, since their situation is extremely favourable, and they have a sufficiency of room. The method I have adopted in the planting of willows, is to have them in rows, three yards asunder one way, and two the other; by which means 840 trees may be planted on a statute acre. Admitting that the present high price of timber continues, and there does not appear the slightest probability of any diminution taking place, these trees, in thirty years time, will be worth at least 20*s*. apiece. This would give 30*l*. per acre, every year; from which profit, however, must be deducted a part of the previous annual value of the land thus employed, and the interest of money. For the first eight or ten years after planting, I calculate that nearly as much produce may be got from the land, as would pay a fair rent for it.*

"The alder also is a tree, which would, in my opinion, be extremely beneficial to the planter, though its growth does not appear to be by any means so rapid as that of the willow. The bark of it gives a very good red dye, and considerable quantities of it are sent to Manchester, and the other manufacturing towns in Lancashire, for this purpose. It sells, when peeled, at the rate of 5*l*. per ton; when laid down at Manchester, as high as 6*l*. or 6*l*. 10*s*."

In addition to the quick growing woods which have been mentioned, it appears probable that very many situations might be found, on which the white and black poplar might be planted with much advantage, as well to the individual proprietor, as to the country. The timber of the former sells at present for 2*s*. a foot; and is held in considerable estimation for many purposes, particularly for the flooring of the rooms in farm houses, for the flooring of cheese rooms, &c. In short, nothing is wanted to the complete renovation of the timber, in this particular county, and in the kingdom at large, but the application of some stimulus which might induce the proprietors of land to improve the situations and opportunities afforded them by nature. Whatever this stimulus be, it should be applied quickly; otherwise the nation must suffer materially from the scarcity of this most important article of internal produce.*

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* The wood of the willow has a local value in this county, from its being largely used in the salt manufactories, in making baskets, for the reception of the salt when taken out of the pan.

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* Though too little regard is undoubtedly paid to planting in this county, yet there are individual instances, in which it is made an object of considerable attention. I have been informed that in Lord Stamford's leases for lives, the tenants are bound to plant every year a certain number of trees, oak, ash, elm or poplar, proportioned to the extent of their farms. The plants are found by the owner of the land; and the tenants condition to preserve them. Similar clauses are inserted in the leases granted by other landed proprietors, but I doubt whether sufficient attention is paid to enforcing the execution of them.

CHAPTER XI.

WASTE LANDS.

THOUGH enclosing has taken place to a greater extent of late years, there still remains a very considerable proportion of uncultivated land in this county. The forest of Delamere, in Eddisbury hundred, though somewhat diminished in size by late enclosures, still contains about 10,000 acres, in a state of little or no profit. In Macclesfield hundred, besides the very extensive district of hilly uncultivated land on the Derbyshire border, there are several large tracts of peat moss, as Lindow Common, Featherbed Moss, &c. In Northwich hundred, we meet with another considerable district of waste land, called Rudheath; part of which has, however, been planted within the last few years, chiefly with Scotch fir; the plants appearing vigorous and healthy: while another considerable tract of land upon it has been enclosed, and, at considerable expense, brought into a state of cultivation by the spirited exertions of Strethill Wright, Esq. Besides these, there is in very many of the townships in the county, some heath, common, or moss land; the whole or part of which might be brought into a state of profitable cultivation.

The scarcity, which prevailed throughout the kingdom a few years ago, acted as a powerful stimulus to the enclosure of waste land in this county; and the spirit which was then excited, has still by no means subsided. Many extensive mosses and commons, by the aid of draining, marling, &c. have, within the last two or three years, been brought into a state of cultivation;

vation; and additional improvements of a similar kind are at present either projected, or actually carrying into execution. What proportion of the remaining waste land in the county may be enclosed and cultivated, with benefit to the occupiers, is somewhat doubtful. Though considerable success has attended some of the late attempts of this nature on Delamere forest, it seems highly probable that a large part of this tract might be more advantageously occupied in planting, than in any other mode. The same remark may be made with respect to Rudheath, and several other districts of waste land in Cheshire. It is a question of much general interest and importance, and one which seems to admit of more doubt than is usually attached to the subject, whether a considerable portion of the capital employed in the enclosure and improvement of wastes, might not be more beneficially applied to the improvement of land, already in a state of partial cultivation. Though perhaps no very decisive answer can be given to this question, yet it appears to me that it is a point, the consideration of which has been in general too much neglected by writers on this subject. They have merely looked to a certain quantum of advantage resulting from the cultivation of lands formerly waste; without considering that, in a variety of instances, the application of the capital necessary for this purpose, to the improvement of land already enclosed, would give a much larger proportion of produce, and of course prove more beneficial both to the individual proprietor and to the nation at large. For more remarks on this subject, see the article on *Enclosing*.

CHAP. XII.

IMPROVEMENTS.

SECT. I.—DRAINING.

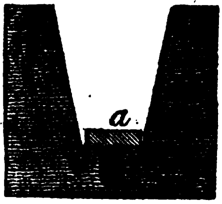
THE discovery of improved modes of draining, and the more general adoption of this practice throughout the country, constitute undoubtedly one of the most important and valuable improvements in modern agriculture. Though a very considerable extension of the practice has taken place of late years in Cheshire, a large portion of land still remains, which would derive the greatest advantage from a proper system of draining. Independently of the districts, which by the pursuance of this system might be brought from a boggy and marshy state into a condition for profitable cultivation, there are, in various parts of the county, extensive tracts of land already cultivated, but which, by means of draining, might be at least doubled in value. This remark is peculiarly applicable to the cold, clayey lands, which are to be met with on so many of the dairy farms in Cheshire. The amelioration of which these are susceptible, would amply compensate the farmer for any immediate expense to which the draining might subject him; a fact which has been well established by the experience of all who have made the attempt with any degree of judgment. The number of these, I am happy to say, is at present by no means inconsiderable. On many of the dairy farms in the county, draining has been practised to a great extent, and with the most complete success; the increased quantity and the superior quality of the grass on his pastures constituting a sufficient reward to the farmer, for the expense bestowed on their improvement.

The modes of draining adopted in Cheshire are various. That of Mr. Elkington has been less practised here than in many other counties; a circumstance owing, in all probability, to the general flatness of the surface, which precludes in a certain degree the practicability of tapping the springs with a boring auger; and in some measure also to the nature of the draining required, which is very generally superficial: I have known this method however pursued in several instances with very considerable success.

Mr. Fenna gives the following account of the several kinds of draining, which have been, and are employed in this county.

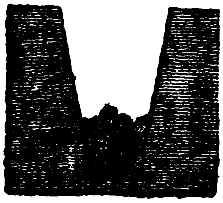
" The drain originally employed in this county, was simply a trench laid at the bottom with kids or faggots of wood.

" Subsequently to this, the turf or sod drain was adopted to a great extent in the county; and was found of advantage on wet, clay lands. This is made of considerable depth; and along the middle of the bottom, which is about a foot in width, is cut a narrow channel nine or ten inches deep, and four or five inches wide, with a spade, formed like the barrel of a large auger. A hollow hoe is then drawn along the bottom to level the channel; which is afterwards covered with the upper sod, the grass side downwards, as in the section annexed, where *a* is intended to represent the sod covering the channel. This is perhaps one of the best modes of draining in which brick or stone are not employed.



"Another kind of drain that has been resorted to on some occasions, is formed of pieces of wood, eighteen inches in length, placed crossways close together at the bottom of the drain, and covered with light faggots and straw to prevent the soil from falling through.*

"Some drains have been made of flag or slate stones, reared together as in the annexed section, and covered with pebble stones, &c.



"Others

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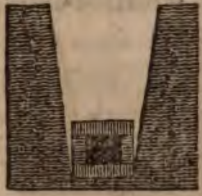
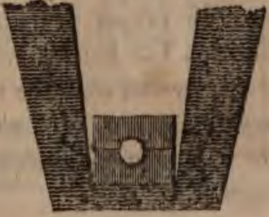
[*] This is a very bad mode, from the constant falling of one side, and the consequent stoppage of the drain.—*A Correspondent*

"Others have been made by small stones or broken bricks thrown promiscuously into the drain, to the height of twelve or fourteen inches; covered with straw, and the drain filled up.

"Where common bricks are used for draining, they are generally placed, as represented in this sketch.



"By this method, twenty four bricks are used to complete one yard of the drain. Since the adoption of brick drains however, a brick has been formed for the express purpose, nine inches long, six inches wide, and three inches and a quarter in thickness; on one of the sides, is pressed in at the making, half a cylindrical piece of wood of three inches in diameter. Two bricks of this form, being laid together, leave up the middle a circular bore or hole, three inches in diameter, for the passage of the water. The annexed sketch represents the section of a drain laid in this manner.*



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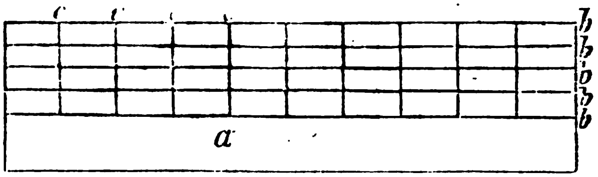
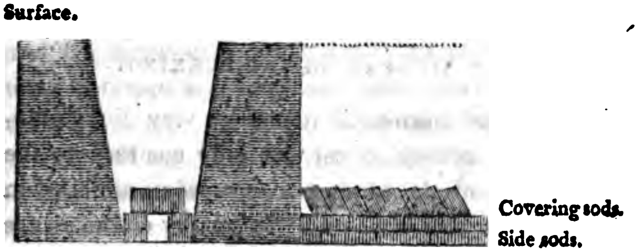
* On clayey soils this drain answers extremely well; on sandy soils, it is less useful.—*A Cheshire Farmer.*

" Eight of these bricks are sufficient to complete one yard of the drain. Unfortunately however the heavy tax with which they are charged, operates against their more general use.

" A new method of turf draining has been in many instances adopted, which is done in the following manner. The surface of the ground, where the drain is intended to be cut, is marked out thus.



" The sods from the space marked *a*, which is nine inches wide, are taken out at a spade's depth, and laid carefully by the side of the drain for covers. The lines marked *bb*, &c. four inches from each other, and the cross lines *cc* nine inches apart, are cut down with the spade to the depth of three inches, and the sods afterwards taken out at the same depth. These sods, resembling bricks in their size and shape, are laid carefully on the same side as the sods intended for covers. The drain is then sunk to its proper depth, and the stuff taken out is thrown to the other side. The bottom is levelled with proper draught for the water, and set with the sods like bricks, two in height on each side ; these are covered with the larger sods from the space *a*, the grass side of each sod being turned downwards. The following is a sketch of a longitudinal and cross section of this drain.



"Whether this last mode of draining, can be justly recommended for durability is doubtful, but as it does answer well for a few years, and as the original expense is inconsiderable, it is highly deserving the attention of the farmer, and will on many occasions pay him if he has only three crops to take off the land thus drained.*

"Elkington's mode of draining, though not generally practised in Cheshire, has however been adopted on several farms with great success. Instances may be shewn in the county where the boring of a few auger holes has completely drained many acres of land."

The tax upon bricks is undoubtedly one of the greatest obstacles to the extension of draining in Cheshire, as well as in every other part of the kingdom. Were the operation of the tax upon this particular mode of application entirely removed, many thousands of acres in this county, which are at present either waste, or in a state of little profit, might be rendered productive and beneficial to the community.†

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* This is undoubtedly the best mode of draining with sods, and possesses a very considerable degree of permanency.—*A Cheshire Farmer.*

† See the chapter, *Obstacles to Improvement.*

SECT. II.—PARING AND BURNING.

Paring and burning is at present very little practised in this county, being not only contrary to the common law of the land, but expressly prohibited in the greater number of leases. This latter circumstance is the result of a generally prevailing idea that it is extremely injurious in its effects upon the soil; an opinion which, carried to a certain extent, and applied in particular instances, may have some foundation; but when brought forward as a general axiom in agriculture, cannot be too severely deprecated. Indeed it appears to me, from conversations I have had with several intelligent farmers on this subject, that the extension of the practice of paring and burning, in certain cases, and under proper modes of application, would constitute one of the most important improvements of which agriculture is susceptible. In several instances where it has been adopted in this county, its effects have been decidedly beneficial. Mr. Fenna says on the subject,

"There is no doubt, that paring and burning, if indiscreetly employed, becomes injurious by exhausting, or rather destroying the soil. On the other hand, some land might be shewn in this county, that is apparently much benefited by the practice. A small croft, containing two statute acres, had a loose open soil, rather [illegible]dle and cold, lying upon a bed of marl, six or seven [illegible] thickness; which, in a part of the field, was per[illegible] [illegible]ripes or [illegible]ds, proceeding from the neigh[illegible] [illegible] under the surface. This croft pro[illegible] [illegible] rushes, rough grass, and [illegible] refused; and was [illegible] than 5*s*. per acre.

About seven years ago, two drains were opened in that part which was springy, laid with brushwood, and covered. It was then pared and burnt; the ashes spread upon the surface, ploughed, and sown with oats, which yielded 120 measures of 38 quarts each. Since that time, it has produced three other crops of grain, and one of clover mown for fodder; all of which have been extremely luxuriant; and the land now lets for dairy pasture at 30*s*. per acre."

To those however who oppose the practice of paring and burning, this instance may appear by no means decisive. The amelioration of the land may be attributed, not to the agency of this process, but to the drains which were previously opened in the field. That some portion of the actual effect must be ascribed to the operation of the latter cause, can scarcely be doubted; but from the circumstances of the case, it appears to me equally certain that the paring and burning must have contributed greatly to the improvement in question. On a rough pasture like the one alluded to, where the natural productions are rushes, different species of carex and coarse grass; and where the stratum of soil is filled with vegetable and animal matter of different descriptions; it is clear that any process which shall reduce these substances to a state in which they will afford nutriment to a new and more profitable vegetation, must be in a high degree beneficial to the land. Such a process is that of paring and burning; and when practised judiciously on such situations, it can scarcely fail of being attended with advantage.*

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* Paring and burning seems to be particularly advantageous on coarse, rough land, where the weeds and other vegetable matters are by this

It may not be difficult to assign several probable causes of the prejudices which exist in the country at large, against the practice of paring and burning; or to shew that these causes are, generally speaking, ignorance and mismanagement on the part of the occupier of the land. The farmer finding from the first crop or two, immediately after paring and burning, that his land is in good condition; may be induced to work it

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this means destroyed, and the nourishment they consumed applied to more useful purposes.—*A Correspondent.*

Wherever there is a considerable depth of black peat, paring and burning may be practised without detriment to the land, and with much profit to the farmer. On thin soils it seems to be hurtful by diminishing the quantity of the soil.—*I. Potts*, Esq.

The opinion that paring and burning may be of advantage on peat or moss land has however been disputed by an ingenious author, who, speaking of this mode of applying the practice, says, "In this case it is not the plants which grow upon it, but the very substance itself that served as a soil, on which the plants grew, that is totally destroyed by incineration. This substance is by burn-breaking amazingly diminished in quantity; and the little that remains, instead of soil, after this destructive process, is an inert earth, which is more unfit for the purposes of vegetation, than any other which has ever fallen under my inspection." See Anderson's Essays, vol. iii. p. 257.

On the other hand, Mr. Young, in the Agricultural Survey of Suffolk, remarks, "that it is scarcely possible, profitably, to bring boggy, moory, and peat soils, from a state of nature into cultivation, without the assistance of fire; which is the most effective destruction of the spontaneous growth; and never fails, but because the men employed do not pare deep enough." On the opinion, that the practice of paring and burning in fenny districts tends greatly to reduce the quantity of soil; an opinion founded on the sinking of drained land that has been pared, I find the following remark made in a note to the Agricultural Survey of Lincolnshire by the same author. "It is well known that earth is not to be dissipated by combustion; it is more likely that this appearance proceeds from the light peaty earth of a fen soil being gradually consolidated by alternate cultivation and pasturage, so as to sink below the level it formerly preserved in its uncultivated state."

so hard by successive crops of corn, that it is thrown at the end of a few years into a complete state of exhaustion; a circumstance which is generally attributed to the bad effects produced upon the soil by the process of paring and burning.* The practice too may be employed on soils, and in situations, by no means adapted to its favourable operation: as, for instance, on cold, wet clay land; where paring and burning seems to be attended with less advantage than in any other situation. Another probable cause of failure in many instances may have been the overburning of the turf; and the consequent dissipation of certain substances, which are, in their nature, conducive to the fertility of the soil. That carbon constitutes a principal aliment of vegetable life is clearly ascertained by the analysis of vegetable matter. This substance, in the process of burning the turf, may be dissipated, either by entering into combination with the oxygen of the atmosphere, and passing off in the form of carbonic acid gas; or by combining with a certain portion of hydrogen, furnished by the vegetable matter, and thus forming an oleaginous substance, which escapes with great rapidity if a large surface be exposed to the air, during the burning of the turf. On these accounts, it is evident that a slow smothering fire, and as small an exposure to the air as possible, are both necessary to the success of the process: and that if these circumstances are not attended to, the ashes procured will be in a great measure destitute of those fertilizing properties, for which otherwise they are so remarkable.

From the small extent to which paring and burning is carried on in Cheshire, nothing peculiar can be stated with respect to the process, or the implements employed in it. Under the next article is mentioned the practice adopted by two or three farmers in this county, of burning gorse, and spreading the ashes upon their summer fallows.

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* See Middleton's Report of Middlesex, p. 296.

[Since writing the above, I have been informed that paring and burning for potatoes is practised to a considerable extent in the townships of Carrington and Partington, in the northern part of the county.]

SECT. III.—MANURING.

Under this head, it will be necessary to notice individually the following manures, which are all employed to a greater or less extent in Cheshire.

Marl.
Lime.
Dung.
Sand.
Peat moss.
Ashes, and soot.
Bone dust, rape dust, &c.

It will be requisite also to mention some experiments which have been made on the application of salt as a manure; though on this subject no result that can be esteemed perfectly satisfactory has hitherto been obtained.

MARL.

This is unquestionably one of the most important of the Cheshire manures, whether we consider the extent to which it is applied, or the great utility connected with its application. It is found in almost every part of the county, but in greatest abundance, where the prevailing soil is a clay, or clayey loam. Under sandy, or mixed soils, it is very frequently met with; but usually at a more considerable depth. In a few instances, it has been discovered between two strata of sand stone: this is the case in some parts of the hills, on the western boundary of Delamere forest; where the marl obtained is of a very superior quality. In the hundred of Wirrall, where there is a very considerable predominance of clay, it is met with in abundance; and is used to a greater extent there, than in any other part of the county.

The term *marl* is employed in Cheshire in a most comprehensive sense, including a variety of substances, very different in external appearance, and varying greatly, if not in the nature of their constituent parts, at least in the proportions in which these are arranged in the mass. The most common varieties in the county are distinguished by the appellations of clay marl, slate marl, and stone marl; the first of these kinds is met with in the greatest abundance, and is perhaps the most generally beneficial. In some instances however the farmer mistakes a brown, shining clay for this description of marl; by putting which on his clay land, he throws away his labour, and rather injures than benefits the soil. The criteria of the excellence of marl must, of course, have a reference to the different kinds employed. Generally speaking that may be esteemed good, which is of a dark brown colour, intersected with veins of either a blue, or light yellow shade; it should be greasy to the touch, when moist; and friable, when dry. Marl of this description, when put into water, will fall to pieces, allowing a considerable portion of sand to sink to the bottom of the vessels; from the application of which simple test the farmer might, in many instances, derive much advantage. There is an excellent kind of marl sometimes met with, which is vulgarly called dove dung, from its resembling in appearance the dung of pigeons.

The quantity of marl used in this county, varies according to its quality, and the nature of the soils on which it is used. On a light or sandy soil, two cubic roods of marl, each rood containing 64 solid yards, is reckoned a good covering for a statute acre. On strong retentive clay land, one rood is generally found sufficient for the same extent of surface. The usual time of marling is in the summer months; beginning in May, when the ploughing is over, and continuing till the commencement of harvest. It is sometimes laid on the green sward in winter; and, after being acted upon by the frost, is ploughed in the following spring, generally for oats.* Marling on fallows is also practised to a very considerable extent.

The expenses of marling vary greatly, according to situation and other circumstances. If the marl lies under high ground, so that a day pit can be made, it may be procured at a comparatively small expense;

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* Marl is generally laid upon the turf, and after the frost has had its effect upon it, it is sometimes harrowed before the field is broken up. *Original Report.*

but from the general flatness of the surface, few opportunities of this nature occur. Perhaps the following may be a fair average estimate of the expenses connected with marling. Baring the marl, say of three feet of superficial soil, 12*s*. per cubic rood, of 64 yards; getting and filling the marl 12*s*.; leading it, supposing the pit to be at the distance of 100 or 150 yards, 1*l*. 1*s*. per rood; spreading 4*s*. per rood; in all, the expenses of marling may be averaged at about 5*l*. per statute acre.

Marl is spread immediately after being carted upon the land, but its pulverization is left almost entirely to the influence of the atmosphere. Some kinds are much more easily reducible to a powdery state, than others; and this difference may determine, in many instances, the propriety of their respective application. On stiff clay lands, or where immediate crops are the object of marling, those marls, which pulverize with the greatest rapidity on exposure to the atmosphere, are the most beneficial: on light, sandy soils, or where they are applied with the view of producing more durable effects, the more tenacious kinds may be employed with greater advantage. Under the latter mode of application, the effects produced on the soil are not evident, till after repeated ploughings; but they frequently continue to manifest themselves during a period of ten or twelve years.

That marl is actually productive of the greatest benefit to the lands on which it is used, is a fact which can admit of no doubt. Much variety of opinion however exists, as to the mode of operation by which this benefit is effected. Several intelligent persons, with whom I have spoken on the subject, consider the calcareous matter which it contains, as the principal, if not the sole agent, in the improvement of the land. Others have stated it as their opinion, that the principal advantage derived from marl, is the addition of bulk or quantity which it makes to the soil; while others again regard its action as of a mechanical nature; considering the improvement of the land, on which it is applied, as the consequence of an alteration which it makes in the texture or disposition of the soil.* Upon an attentive consideration of the subject, it appears to me in the highest degree probable, that marl may derive a certain portion of its utility as a manure, from each of the three causes which have been assigned. From analysis of the substance, it is found to be an intimate mixture of the aluminous and siliceous earths, usually combined with a certain portion of carbonate of lime, and not unfrequently deriving a tinge from the presence of an oxide of iron. The latter substance, however, from the smallness of its quantity, cannot be supposed to produce effects, either beneficial or the reverse. With respect to the calcareous earth contained in the marl, it must undoubtedly have, to a certain extent, the same action that would be produced by the direct application of lime as a manure; but as it is rendered clear, by actual experiment, that some descriptions of marl which are used with advantage, do not contain any portion whatever of carbonate of lime, we cannot certainly attribute the efficiency of marl to this cause alone.* It must have some additional operation upon the land, from which a certain portion of its value, as a manure, is derived. This operation may consist either in the increase of soil obtained by its application, or in the change which it produces in the texture and quality of the land on which it is laid. Marl may itself be considered as a soil, capable of affording nutriment to every description of vegetable substance: when therefore it is ploughed into the ground, a positive addition of bulk is obtained, and, of consequence, a more abundant source of nutriment for succeeding crops procured. In the hundred of Wirrall, where the stratum of soil is, generally speaking, thin and poor, much advantage is derived from the application of marl, simply as an increase of quantity to the soil. On light sandy land, an additional advantage is connected with its use; the marl, from the large proportion of clay which it usually contains, having a tendency to stiffen the soil, and to bring it to that medium, or neutralized state, (if I may so express myself) which appears the most decidedly favourable to the purposes of vegetation. If this statement be accurate, (and I have every reason from enquiry and observation, to believe it to be so) the utility of marl is derived from three several sources; viz. from the calcareous earth, which it contains; from the increase of soil obtained by its application; and from the change which it effects in the disposition of the parts composing the soil. The last of these modes of operation, it is obvious, will be greatly varied by the nature of the soil to which the marl is applied. On stiff clay land its effect in altering the texture of the soil is less considerable than on any other.

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* The best marl, is that which contains the largest proportion of lime. Its application is undoubtedly the most beneficial on light soils.—*A Correspondent.*

The great advantage of marl seems to arise from its adding bulk to the soil. On light sandy land, it stiffens the soil, and prevents the rain water from passing through too rapidly.—*A Cheshire Farmer.*

Marl appears to be principally of advantage from the increase which it gives to the quantity of soil.—*A Correspondent.*

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* Out of twelve specimens of marl, which Mr. Wilbraham, of Delamere Lodge, sent to Mr. Davy for examination, eleven were found, by that ingenious and accurate chemist, to contain calcareous earth in various proportions. As the result of trials made upon a number of specimens procured from different parts of the county, I have found that, though the greater number contained a certain proportion of carbonate of lime, there are several kinds which do not effervesce in the slightest degree upon the addition of the dilute sulphuric acid, and consequently do not contain any portion of calcareous matter. Still, however, they are called marls by the farmer, and are found to produce an ameliorating effect upon the land.

For a more particular account of the nature, and probable origin of the marl found in this county, see an ingenious paper in the *Appendix*, by J. T. Stanley, Esq.

LIME.

Lime is used to a very considerable extent as a manure in most parts of Cheshire, but more particularly on the eastern side of the county, where it is procured in great abundance, and at a tolerably cheap rate, from Derbyshire. The lime kilns at Newbold-Astbury, near Congleton, likewise supply a large district, to the south-east of the county, with this valuable article. The larger proportion of the lime stone used in the middle and western parts of Cheshire, is procured from the Welsh coast, and burnt at the different kilns in the county: some of it also is procured from Staffordshire. In the hundred of Wirrall, a comparatively small quantity is used as a manure; a circumstance which may be attributed principally to the nature of the soil in this district.

Lime is in general laid upon the fallow land, after having been previously made into a compost with gutter clods, the scourings of ditches, &c. The more completely it is ploughed into the land, the better; its action consisting in the disorganization of the vegetable and animal matters contained in the soil; and in their conversion into a state in which they are capable of affording nutriment to a new vegetation. Some difference of opinion exists as to the utility of lime when laid upon grass land. Mr. Fenna shewed me the result of an experiment he had made, by which it appeared that not the slightest advantage was, in that instance, obtained from its application in this way. On the other hand, I have been assured by one or two intelligent farmers, that they have employed lime with the greatest benefit on their grass lands. I can only reconcile this difference of results, by attributing it to a difference in the nature of the soils on which the trials were made. On clayey soils there is little or no vegetable matter for the lime to convert into manure.

The quantity of lime laid on an acre varies, in this county, from 70 to 140 bushels. There is likewise a considerable variation in the price at which it is procured. The average price may perhaps be stated at seven-pence or eight-pence per bushel. Good lime, brought by the Staffordshire canal in iron boats from the neighbourhood of Leek, may be purchased, at the wharf at Acton bridge, at sixpence the bushel.

DUNG.

Wherever the farmer can procure an adequate supply of dung, and at a reasonable price, he prefers it, and not without justice, to any other kind of manure. The farm yard dung is usually mixed with soil obtained from the sides of lanes, with furrows drawn from between the buts of pasture land, with sand, gutter-clods, ditchings, &c. forming a compost the most beneficial perhaps that can be laid upon the land. On some of the principal farms in the county, the practice of making these farm yard composts has been greatly extended of late years, and the management in this respect very much improved. By spreading over the yards sand, straw, or any refuse substance of the farm, and allowing the cattle or pigs to go upon these during the winter, a compost is obtained, highly valuable for every agricultural application. Many farmers have large paled yards for this purpose, in which their store pigs are kept during the whole year; and thus not only an increased quantity of manure is obtained, but the great inconvenience arising from the method, too commonly adopted, of letting the pigs run loose about the farm, is avoided. Generally speaking, however, much too little attention is paid by the farmers in Cheshire to the preservation of their dung. Without considering, or perhaps without knowing, that an exposure to the sun, air and rain, has a tendency to abstract the most valuable part of the manure, they construct their dunghills in situations, and in a way, which is most favourable to such an abstraction. A good farmer, by judicious management, will accumulate twice as much farm-yard manure, as his more indolent or inattentive neighbour, though their opportunities with respect to this are the same.

Not unfrequently dung is made into a compost with lime and soil; sometimes marl is used for this purpose. A considerable proportion of it is also laid on the land for mowing, pasture or tillage, in an unmixed state. The practice of laying dung on the green sward, and letting it remain there two or three years, before the land is broken up, is more general than formerly;

merly; but the advantages of this mode have been doubted.

The price of dung varies, according to the kind employed. The dung of those animals which are fed upon the substances constituting in a great measure the subsistence of man, is esteemed more valuable than that procured from animals whose food is of a different description. The dung of swine, of horses fed upon corn, &c. is more beneficial as a manure, than that of cows, sheep, or horses fed entirely upon grass, or hay. The average price, in this county, may perhaps be stated at seven shillings per ton.

SAND.

One of the principal agricultural improvements which has taken place of late years in Cheshire, is the introduction of sand as a manure for stiff clay lands. This practice is, indeed, still in its infancy in the county, but the success which has invariably attended its adoption, will, in all probability, render it much more general. The value of sand as an improvement to the soil was formerly little known; a few loads were sometimes carried into the farm yard, but even these instances were rare till about thirty years ago, when T. Corbett, Esq., of Darnhall, began to use very considerable quantities; sometimes mixing it with dung, sometimes laying it raw on his grass lands. The success which attended these experiments induced several farmers in the neighbourhood to follow the example of Mr. Corbett; and the practice has since been introduced on a number of the principal dairy farms in the middle of the county, where opportunities for its adoption occur.

Such opportunities are by no means uncommon; deep beds of sand being frequently met with under the clay, which predominates as a superficial stratum.

The kind of sand esteemed most favourable for laying on clay lands, is usually of a red colour, derived from an oxide of iron contained in its substance, and is soft and unctuous to the feel. No very accurate analysis has hitherto been made of it; but it certainly contains a considerable proportion of aluminous earth, combined with the siliceous particles of the sand. In none of the specimens, which I procured for the purpose of experiment, have I been able to detect the presence of any calcareous matter.

The advantage of sand, as a manure for stiff clay land, appears to be derived from two sources; viz. the increase of quantity made to the stratum of mould by its application; and the alteration which it produces in the texture and disposition of the soil. The greater efficacy may undoubtedly be attributed to the latter of these causes. The intermixture of the sand with the clay, which is effected by various means, has a tendency to lighten the soil, and to bring it to that loamy state, which is the most favourable to the purposes of vegetation.* In this respect, its action is the counterpart to that of marl, as applied on light sandy land. In both instances it is the object of the farmer to bring his soil to that medium, or loamy state, which he finds by experience is most beneficial: marl, by stiffening the soil, produces this effect in the one case; sand, by opening and lightening it, produces a similar effect in the other.

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* The sand is intermixed with the clay, by being washed into the clefts which are formed in dry weather, or frost; or by uniting with the soil, when in a moist state from heavy rains.

Mr. Manley of Merton, who has employed sand with the greatest advantage on his clay soils, makes the following remarks on this subject.

"The application of sand as a manure, is of the greatest advantage in many respects. When there is a piece of strong clay land in tillage, and the farmer has an opportunity of covering it over with sand, about twice as thick as in a common set of manure, the soil will be pulverized and opened by this means, will give better crops when in tillage, and when laid down, will produce a finer herbage, less liable to be parched in dry, or trod down in wet seasons. It is excellent management in the farmer, before he ties up his cattle for the winter, to lay a coat of sand, at least a foot in thickness, where he intends to throw his dung out of the cow houses. The dung should be repeatedly levelled on the sand, and a second coat of the latter laid on towards the end of February; upon which should be put the remainder of the dung procured before the cattle go to grass. As soon after this time as possible, the compost should either be turned, and mixt well where it lies, or cut down *in breasts*, filled into the dung carts, and taken away to some situation near the land on which it is intended to use it. Here it should be laid in a heap of at least two yards in thickness. After remaining two or three months in this state, it is in excellent condition for putting upon the land; and will be found upon the whole, one of the most advantageous manures the farmer can employ, particularly on soils where there is a considerable predominance of clay."

PEAT MOSS.

This substance, made into a compost with lime or dung, has been employed in several instances with great success. The Rev. Croxton Johnson, of Wilmslow, who has made use of it to a considerable extent, informs me that he has experienced the most decided benefit from its application as a manure. The following is the practice which he usually pursues in preparing the compost. In the beginning of January the moss is trenched, and thrown up into ridges, that it may be dried and pulverized by the frost. Towards the latter end of February, it is turned over and laid flat, when it is usually found considerably lighter than when it was first dug up. It is then covered with dung, in the proportion of a fourth or fifth part of the weight, and left in this state for a fortnight or three weeks; after which it is turned over, mixed thoroughly with the dung, and thrown into heaps. A fermentation generally commences in a few days, which varies in continuance according to the degree of moisture in the moss. After it has subsided, the compost is turned over, as before, and the moss at the same time broken very small, that it may mix the more intimately with the dung. In consequence of this process a second fermentation usually takes place, and often to a more considerable degree than in the first instance. The compost is ready to put on the land about the middle of April. Where lime is used instead of dung, the proportion added to the peat moss is considerably smaller. The remainder of the process is conducted in a similar way.

Some useful experiments upon these composts were made a few years ago, by Mr. Paterson of Manchester, and described by him in a paper presented to the Manchester Agricultural Society. He laid three tons of the compost, made from moss and dung, upon a but in one of his meadow fields, and spread an equal quantity of rotten dung upon an adjoining but of the same length and breadth. He found that, although the grass on the but which was covered with the dung only, came up as soon, and upon the whole grew rather higher than that on the other but, yet the latter was of a darker green, and yielded nearly an eighth part more when it came to be cut.

In an experiment with the compost made from peat moss and lime, Mr. Paterson laid 110 tons of this upon five acres of a poor sandy soil, and harrowed it in with the seed, which was oats. An equal quantity of the compost was laid upon five acres of thin, poor clayey soil, and harrowed in with the seed, which was likewise oats. The crop upon the sand field was uncommonly heavy, that on the clay land, though inferior, was however very abundant, considering the state of the soil previously to the application of the compost.

Mr. Paterson states the cost of the peat moss and dung compost, at one shilling and sixpence per ton, that of the peat moss and lime, at one shilling and tenpence per ton. I am informed, however, that at present neither of them can be procured under three shillings per ton.

ASHES AND SOOT.

Turf ashes when laid upon poor, thin soils, have been found of the greatest benefit as a manure, though their application in this way in Cheshire, has hitherto been very confined. They are occasionally used as a manure for potatoes. An intelligent farmer informs me that he has been in the habit, for some years, of burning gorse upon his summer fallows, and spreading the ashes over the land. This he has found to be a most excellent method of improving the soil, the superior abundance and value of the succeeding crop much more than compensating for the trifling expense incurred in getting and burning the gorse, and spreading the ashes. The application of this manure must however depend upon local situation, and other circumstances of the farmer.*

Soot is not much used as a manure in Cheshire. It has sometimes been applied in this way upon wheat land, and has given very vigorous crops for the first year; but its effects are by no means durable. It is procured at the rate of tenpence or a shilling per bushel; forty or fifty bushels are usually laid upon the acre.

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* By a reference to the Agricultural Survey of Lincolnshire, by the Secretary to the Board, I find that the burning both of gorse and straw as manures is a practice occasionally adopted in that county. Mr. Young says, "Burning gorse returns great crops; but the expense is too high." Where straw was burnt, about six tons were used to the acre: it being there valued at not more than four or five shillings per ton. The effect of it was supposed to be more considerable, and more durable than that produced by the dung which the same quantity of straw yielded. See the Agricultural Survey of Lincoln, p. 267. The price of straw in Cheshire is, however, nearly ten times as much as the sum here stated: we cannot therefore expect that it will be disposed of in the same manner; and this may be brought as one of the many instances in which local circumstances must determine the mode of application of any particular article of produce.

BONE DUST, RAPE DUST, &c.

Could bone dust be procured in sufficient quantity, and at a reasonable price, few substances would be more advantageous as a manure. Its effects upon the soil, though not immediately apparent, are in the highest degree beneficial; and their durability does not constitute the least portion of their value. It is however so scarce an article, that few farmers have it in their power to procure it; and on this account, its use is very partial and confined.

Rape dust is another excellent manure, and has been used in several instances that have come to my knowledge, with the greatest advantage. The large proportion of oily and mucilaginous matter which it contains, might indeed induce a belief, *à priori*, that this would be the case. Its scarcity and high price, however, operate against its more general introduction.

Refuse leather, soap lees, woollen rags, &c. have each been used, to a certain extent, as manures in this county; and with different degrees of success. Under the article on Potatoes, I have noticed the application of sea mud in this way, at Weston, near Frodsham.* Gypsum has in a few instances been used, but, as far as I can learn, without the expected advantage.

SALT AS A MANURE.

Though various experiments have been made, with a view to ascertain the utility of common salt as a manure, yet, from the difference which has been experienced in their results, no very decisive or satisfactory conclusion has hitherto been obtained on the subject. It may not be difficult to assign several probable causes of this difference, but it will be proper previously to state a few of the experiments which have been made, that it may be seen what were the modes of application of the salt; and what was the success of the attempts in the several instances. The account of the following experiments, made by a gentleman of Northwich, is extracted from the Original Report of the County.

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* See likewise Appendix, No. 3.

"After draining a piece of sour rushy ground, about the middle of October, some refuse salt was spread upon a part of the land, after the rate of eight bushels to the acre, and in another part sixteen bushels. In a short time the vegetation disappeared totally, and during the month of April following, not a blade of grass was to be seen. In the latter end of the month of May a most flourishing crop of rich grass made its appearance on that part where the eight bushels had been laid.

"In the month of July the other portion produced a still stronger crop; the cattle were remarkably fond of it, and during the whole ensuing winter (which is ten or twelve years since), and to this day, the land retained, and yet exhibits, a superior verdure to the neighbouring closes. Another experiment was made in a meadow, where the aftergrass being of a coarse rank nature, which the cattle refused to eat, salt being laid upon a part of this meadow, they have ever since preferred the grass growing on that ground, to every other part of the field, and eaten up every blade. He also states, that the good effects of salt are particularly seen, by mixing it even with the coarsest manure. A gentleman lately carried a small quantity of couch-grass roots, and other rubbish, harrowed off his land, to the salt works, and laid it for some time upon the ground, where the foul salt, by the direction of the officer, is destroyed; he then carried it back, and mixed it with other manure. His barley and his hay grass were strong, from this composition, beyond his most sanguine expectations. A small quantity of foul salt was also laid upon a court pavement with a view to destroy the vegetation, with which it abounded; the first summer after it was laid on, not a weed, or a blade of grass appeared; but in the summer following, its vegetation was *considerably* more abundant, than it was before the salt was used. Its effects on fallow lands are equally advantageous: by sowing it at the time of breaking up the land for a fallow its strong saline quality destroys vegetation, and every noxious insect; but by being mixed sufficiently with the soil, before the wheat is sown, it adds a strong nutriment, and insures the best of crops."

In a paper published in the Monthly Magazine for March 1802, I find the relation of some additional experiments on the use of salt as a manure, which from their importance, it may not be improper to notice here.

"An intelligent farmer, whose veracity may be depended upon, states, that five years ago, he mixed up a compost of this refuse salt with the earth taken out of water furrows; and at the same time some lime with a portion of the same earth. They were each laid on different parts of the same field. That part of the field which had the lime compost laid upon it, vegetated strongly; but it bore no comparison to the health and vigour of the vegetation of the other part of the field, which had the compost with salt laid upon it; and, notwithstanding the time which has elapsed, he can still trace, by the quantity of grass thrown up, the extent to which the salt compost had been spread.

'" Having had such strong proof of its good effect, he was induced to try another experiment with the salt. He, last spring, strowed a portion of land *pretty thickly* over with it, without any admixture of earth: the consequence has been, that he has not only not received the expected advantage, but vegetation has been destroyed, and the land is, *for the present*, almost bare."

The result of the latter experiment is attributed by the writer of this paper to the mode in which the salt in that instance was applied, which he conceives to be by no means favourable to its beneficial operation. In opposition however to these statements, tending to shew the efficacy of the muriate of soda as a manure, others have been given which would apparently justify a decidedly opposite opinion. Mr. Fenna, in a paper published in the Communications to the Board of Agriculture, vol. ii. relates several experiments he had made, in all of which, this application of salt was either completely, or in a great measure, unsuccessful. On a summer fallow for wheat, full of grass and weeds, he scattered salt over several of the buts, in the month of July; varying the quantity of salt on the different buts, from the proportion of two bush. fifty lbs. to twelve bush. twenty-one lbs. per acre. The fallow was ploughed three times. Except the destruction of a few weeds, on the buts where the greatest quantity of salt was used, no perceptible effect was produced by its application. On another but in the same fallow, salt, in the proportion of ten bushels to the acre, was spread and ploughed in with the wheat; but without the slightest perceptible advantage to that part of the crop, either in its growth, or when arrived at maturity.

A similar result, from experiments made on pasture land, led Mr. Fenna to conclude that salt does not possess the slightest efficacy as a manure; and he notices the existence of the same opinion, among several of the neighbouring farmers, who had been witnesses to his attempts. I have myself made enquiries from a number of respectable farmers in the county; but among the few who have conducted their experiments on this subject with any degree of accuracy, I find the statement of results so varied, that it is impossible to deduce from them any decisive conclusion.

On the banks of the Weaver, above Namptwich, several brine springs break out upon the surface, which have the effect of destroying all vegetation, for several yards round. On the marshes in the neighbourhood of Frodsham, the natural application of the muriate of soda seems to produce effects of a somewhat contrary nature. A considerable extent of these marshes, is overflowed by the salt water, every spring tide: and in the intervening period, is used as a pasture for horses, cattle, &c. The vegetation here is by no means deficient in vigour; the cattle are extremely partial to the grass, and very speedily fatten upon it.

To account for this difference of effect arising from the application of salt as a manure, we may refer principally to two causes; viz. a difference in the mode and degree of application, and a difference in the nature of the soils, on which the experiments have been made. The first of these causes must undoubtedly have an important influence. Regarding the action of the muriate of soda upon vegetable matter as that of a stimulus; (and this supposition seems supported by observation and analogy,) it is natural to conclude that its effects must be varied very greatly by the proportion applied. If used in large quantity, it has a tendency, like every other excessive stimulus, to disorganize and destroy the vegetable substances, with which it comes into contact: when a smaller proportion is applied, or when it is mixed up into a compost, and employed in this state, it may be regarded, by the moderate stimulus it gives to the action of the vessels in the plants, as a promoter of vegetation, and consequently as a valuable manure.* In this respect its effects are analogous to those produced by a similar application of lime; the influence of both substances upon vegetation being varied greatly by the proportions employed. In some instances, as when the land is lying in fallow, it would appear probable that the application of salt, in considerable quantity, might be productive of advantage, by effecting the destruction of all useless vegetable and animal matter; at the same time, its quantity would be so far diminished by the time the seed was put into the ground, as to fit it for affording that degree of stimulus, which is most beneficial to vegetation. The experiments related by Mr. Fenna are the most difficult to be reconciled with these principles; nor is it possible to account for their results, in any other way, than by attributing them to the nature of the soils on which the trials were made.

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* I am aware that this statement of the action of the muriate of soda upon vegetable matter, may not appear perfectly to coincide with that of the late Sir J. Pringle, published in the Philosophical Transactions. With every deference to such authority I cannot but consider it, however, as the most consistent with the general analogy of nature, as well as with the particular experiments which have been made on the application of salt, as a manure. Dr. Darwin was decidedly of the same opinion, though he expresses considerable doubt as to the general utility of salt in this mode of application. See *Phytologia*, vol. i. page 366.

It will however require many additional experiments, and those judiciously conducted, to ascertain the precise utility of salt as a manure. The decision of the question is, at present, prevented by the very heavy duties which are imposed on this article of manufacture; and even were its advantages in agriculture decidedly established, no extension of its application could take place, till the operation of these duties, at least upon the refuse salt procured from the manufactories, was entirely removed.

GENERAL REMARKS ON THE NATURE AND APPLICATION OF MANURES.

From the analysis of different vegetable substances, and from experiments made upon the growth of plants, it would appear that the siliceous and aluminous earths, carbonic acid, water, oxygen, and the remains of animal and vegetable matters, are the materials most essential to the growth and nutrition of vegetables. Analysis would likewise seem to indicate that some of the salts constitute a necessary part of the food for plants; though the variety in the nature and proportion of these salts is greater than that prevailing among the other materials of vegetable nutriment. That a certain proportion of the mould, produced by the putrefaction of animal or vegetable matters, is essential to the fertility of every soil, has been proved by the experiments of Giobert, who found that the siliceous, aluminous, calcareous and magnesian earths, though mixed together in the proportions usual to fertile soils, and moistened

moistened with pure water, never produced a vigorous vegetation, till he employed the water exuding from a dunghill to give moisture to the soil. We are at present too little acquainted with the mode of vegetable nutrition and growth to assign, with precision, the immediate causes of this fact. It would appear, however, from the experiments of Hassenfratz, Saussure, and other enquirers into this subject, that the value of putrid animal and vegetable matters, as ingredients in soil, depends principally, if not entirely, upon the peculiar state of combination in which the constituents of such substances exist; a state apparently the most favourable to their re-organization by the vegetative process. The experiments made by Saussure, on the mould procured from the decay of different vegetable matters, have shewn that the most usual constituents of this substance are carbureted hydrogen gas, carbonic acid, water, frequently containing a small portion of ammonia combined with a vegetable acid, charcoal, and an empyreumatic oil. It is probable that the decomposition of animal substances by putrefaction furnishes materials very similar for the process of vegetation, and that the fertility of any soil is derived principally from the due admixture of such substances with the simple earths; and perhaps also from the proportion of them capable of being held in solution by water. A general knowledge of these circumstances, and of the superior value of putrid animal and vegetable substances as additions to his soils, must induce every judicious agriculturist to bestow much of his attention upon the collection and preservation of all such manures, as well as upon their proper application and distribution to his lands.

" There is evidently a mistaken practice in Cheshire with respect to the application of manure: it is not however an error peculiar to this county, for there are perhaps few parts of the kingdom where it is not to be met with. The practice alluded to is that of laying manure upon land of inferior quality, while that of a better kind remains in a state which wants improvement. This is the general custom of the country, not only with respect to manure which is purchased, but with that also which arises from the consumption of produce on the premises. The better part of almost every farm in the kingdom is robbed, and in some degree impoverished, by attempting to improve, at an evident loss, the poorer parts of it. Where a farm has justice done it, every part in rotation should receive the manure arising from its produce. There are indeed some instances of lands being of so rich a quality, either for tillage or pasture, that by laying any manure upon them an injury would be sustained; but upon the whole, it is an evident fact, that any manure whatever (if not in its nature unsuitable to the soil) will always be attended with a much more profitable return, when laid upon good land, than it will when laid on land of inferior quality. But how does this correspond with the general practice of the kingdom? And can any good reasons be assigned for a contrary practice? If a farmer has money to lay out in manure, or if one part of a farm must be robbed to enrich the other, the most profitable manner of applying that manure is, most certainly, to lay it on the very best part of the premises, which is not already too *rich* for improvement. If you converse with occupiers of land on this subject, they will to a man admit, that one load of manure laid upon good land, will be more effective than two, three, or even four, or five loads, laid upon lands of inferior quality. It must surely then be inconsistency in the extreme, to persist in a practice which is against the fullest conviction of the mind, and that too in a matter where self-interest is so much concerned."*

SECTION IV.—WEEDING.

We frequently hear the farmer calculating the produce of his land per acre; and the multiplication of his bushel, or his grain of wheat; but he as often neglects to consider that many of those plants which are useless, or even injurious in an agricultural point of view, are equally productive of seeds; and that they too will yield their fifty and their hundred fold. Under the section, *Natural Meadows and Pastures*, mention has been made of the weeds most prevalent in corn fields and pastures, to the destruction and extirpation of which too little attention is in general paid. Had we no knowledge of the crop intended to be raised, it would, now and then, be difficult to judge from an inspection of it, whether the marigold, the thistle, the charlock, or the oat was the object of cultivation. It must however be allowed, that though this is too frequent an occurrence, more attention is, in general, paid in Cheshire to the weeding of land in tillage, than of pasture land. In some of the best conditioned pastures we may often see ragwort, docks, thistles, and knapweed, occupying at least half the land, to the exclusion of every useful plant; whilst, in other parts, the prevalence of ox-eye daisy, and colts-foot afford lamentable proofs of the exhausted state of the ground, and the mismanagement of the farmer.†

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* Original Report.

† When I have remarked the greatly impoverished state of any farm,

"Weeding in gardens is performed by the scuffle and the hoe; except in the case of smaller plants, such as onions, carrots, &c. sown broadcast, which are hand wed. About the middle, or latter end of May, the corn fields are, or ought to be, wed with a paddle, or pair of weeding tongs; with which the larger kind of weeds, such as thistles, docks, &c. are either cut off, or drawn up. Still later, but previous to the hay harvest, the farmer who pays attention to his pastures, goes over them, and mows down such weeds as happen to be above the level of the grass. In some places the docks are drawn up in pasture lands with an instrument called a pig's foot; in others, children are employed to cut them with knives, either on a level with, or a little below the surface of the ground; by which means many of them are entirely destroyed, others prevented from attaining any great degree of luxuriance in that year."* They are however as commonly left to seed over the field, as cut

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or piece of land, I have very frequently found, on enquiry, that this might be traced to the nature of the tenure; which has been a lease for lives, two of which have dropped without renewal, while a third only has been left, and that either an old one, or regarded as unlikely to be of long continuance. Under these circumstances, the first consideration of the possessor is, how to make the most of the land in a short time. He takes a succession of crops from it, without giving it either rest or assistance; till at length, if unfortunately for it the life is continued longer than the lessee had calculated upon, it is so completely exhausted, that it is incapable of yielding any profitable return for either seed or labour. In this barren state it remains for the rest of the term; and with the best subsequent management, after the expiration of the lease, several years must elapse before it can be restored to a productive state of cultivation. It has been suggested to me that this injury might be prevented by making it a condition in the lease that the tillage should be limited, wherever such a tenure is reduced to one life, or to two above specified ages.

[*] Mr. Fenna.

cut down in any way; and we have often occasion to regret that the clause, introduced into many leases, empowering the landlord to cut down weeds at the expense of the tenant, if the latter neglects to do it himself, is either not made general, or more frequently enforced.

An ingenious correspondent makes the following remarks upon this subject. "No circumstance operates more in the propagation of weeds, than the neglect of mowing them before they seed upon heaps of dunghill or compost, and on the sides of highways. In consequence of this neglect, every seed that falls is carried out with the compost, and sown upon the land; while the seeds of thistles, and all such as float in the air, convey such a copious supply to the adjoining grounds, that it were to be wished the surveyors of highways, or some other public officers, were not only empowered, but compellable to cut them down, and to charge the expense upon the land-owners contiguous, if they omitted to do it themselves upon proper notice. This I conceive to be a subject of so much importance to agriculture, as to be well worthy the attention of the legislature."

SECT. V.—WATERING.

THE benefits arising from the irrigation of land are so very important, that it seems astonishing this practice has not been more generally adopted, especially when it is considered how numerous are the situations favourable to its application. In Cheshire, though the general flatness of the county, and the great number of rivulets and streams by which it is intersected, afford every natural inducement to the pursuance of this system of improvement, irrigation is still in its infancy. The farmers of the old school, who are accustomed to pursue, with undeviating steps, the track in which their forefathers preceded them, manifest a great degree of unwillingness to admit on their lands the application of a system with which they have little practical acquaintance: and even though some of them are fully aware, from experience, of the advantage derived from natural overflowings, still they will not suffer themselves to be convinced that an artificial floating may be productive, under judicious management, of equal, if not greater benefit to the land. Prejudices of this nature are certainly, however, on the decline; and the spirited manner in which some of the principal farmers in the county have conducted the improvements of draining and irrigation on their land, together with the success which has almost invariably attended such exertions, will, in all likelihood, lead to a very considerable extension of these practices in Cheshire.

Among those individuals in the county who have benefited their lands by irrigation, I may mention particularly the Rev. Mr. Bayley of Wheelock. I have never had an opportunity of seeing the system of floating, which this gentleman pursues; but I am informed it is conducted with a degree of judgment and consequent success, which has contributed greatly to increase the value of the land. On some farms, where the situation of the buildings is favourable for the purpose, the stream of water intended for irrigation is allowed to run through the farm yard, previously to its coming upon the fields; by which means a considerable quantity of manure is collected, and deposited on the land. This practice is pursued with the greatest success on the farm of Mr. Beckett at Broom-fields, two or three miles to the south of Warrington, and on several other large dairy farms in this county.

CHAP. XIII.

LIVE STOCK.

SECT. I.—CATTLE.

THE dairy constitutes so principal an object of attention to the Cheshire farmer, as to render the subject of this section highly interesting and important with a reference to the agricultural economy of the county. It will, therefore, be necessary to enter into a more particular detail of the system of dairy management, pursued in this district, than might otherwise appear consistent with the general plan of the Report. The papers on this subject, contained in the original Report, are copious, and by no means deficient in point of arrangement. To ascertain how far a reliance might be placed on their accuracy of statement, I took an opportunity of circulating them among several respectable and intelligent dairy farmers; requesting at the same time any additional remarks, which might appear necessary or important to the subject. Finding, as a result of this enquiry, that the entire accuracy of these papers might be depended on, I have judged it most adviseable to insert them here, as they stand in the Original Report; omitting, however, the account of the diseases of cattle, which appears superficial and trifling. The few remarks and comments, with which I have been favoured, are inserted as notes.

Breed of Cattle.—"There is no species of cattle which is peculiar to this county, and that being the case, the nature of the breed is scarcely to be described. The long-horned Lancashire, the Yorkshire short-horned or Holderness, the Derbyshire, the Shropshire, the Staffordshire, the Welch, Irish, Scotch, and the new Leicestershire cattle, have at different times been introduced in different parts of the county, and the present stock of dairy cows is a mixture of all these breeds. It is impossible to say which of the intermixed breeds are most approved of as milkers, milk being the general object. To describe the variety of opinions on this head, would be almost an endless task. There are some persons who prefer half-bred cattle from the Lancashire and present Cheshire; others prefer a breed between the Cheshire and Lancashire; and there are those who prefer a half breed between the Cheshire and Welch; whilst a cross between the Lancashire and Holderness, and one between the Lancashire and Welch, have also their advocates. On the better lands, a breed partaking of the short-horned Holderness, or the long-horned Lancashire, seems to be most prevalent. On the inferior lands, a middle sized short-legged breed, with a cross of the Welch in them, are most preferred. The size, form, and production of the udder is more attended to than the figure and bulk of the beast; and it seems to be universally allowed, that there is very little, if any, connection between utility for the dairy, and the much extolled points of fashionable breeders as to shape, beauty, &c. Where larger, and what are called finer shaped breeds, have been tried, they do not in general appear to have answered so well as those smaller hardy ones before described. The general practice in breeding here is to cross; and it seems to be admitted, that such cows as are bred *upon the land* are found to answer best; for when a purchased cow happens to have been bred upon poorer land than what she is brought to, it is generally not till the second year, at the earliest, that she comes to her full milk. It is admitted also that milking stock is frequently kept too long without changing. If a cow happens to prove a good milker, she is commonly kept for that purpose, until she is of little value for any other. An old cow may give more milk than a young one, but it is not of so rich a quality; and this is not all, for an old beast will require more and better food, to keep her in condition and in full milk, than one of a proper age; which age is thought to be between four and ten years; but there are many who think a milker is not in her prime till five years old. The points which are generally thought to indicate a good milker, we believe, are as follows, viz. a large thin-skinned udder, large milk-veins, shallow and light fore quarters, wide loins, a thin thigh, a white horn, a long thin head, a brisk and lively eye, fine and clean about the chap and throat; and, notwithstanding some of these points will be allowed, in feeding cattle, to be good ones, yet, upon the whole, a good milker is generally ill-shaped. These indications, as a general rule to judge by, like all other general rules, have many exceptions. It is found, however, by experience, that those cows which possess an aptitude to fatten, very seldom, if ever, are profitable milkers. The milking cows of Cheshire will not, it is thought, weigh more than seven scores per quarter, on the average, when fattened; their prevailing colours are red, brindled, and pied; with almost universally *finched* or white backs.*

"In the present breed of milch-cattle (profitable as they undoubtedly are) the general opinion seems to be, that there is very little room for improvement: considerable attention having already been paid to them. That there is *some* room for improvement, must be admitted; it has probably, however, no great degree of reference either to *bone* or *offal*. We have noticed before, that the milch-cattle of Cheshire are frequently continued as milkers to too great an age, before they are slaughtered; but we are at the same time inclined to think, when the cattle of this county are properly fattened, and killed at a proper age, that our *roasting pieces* are not inferior in flavour, &c. &c. to those of any other breed of cattle in the kingdom." Much has been said about a waste of the produce of the land, in the production of bones and offal;—perhaps it is so. It cannot be denied, that improvement may be made in the general breed of almost every county in the kingdom; but still *refinements* may be carried too far; nor is it judiciously promoting the ends of such improvements, to induce the country to expect a greater degree of success than what, in general practice, is commonly attainable. The professed objects of fashionable breeders are, to lessen the quantity of bone and internal fat, reduce the weight of inferior pieces, and add to the bulk and quality of the prime joints, such as rumps, sirloins, &c. &c. We admit (for the sake of argument, *what is doubtful)* that these objects have been attained; but has it been shewn, or can it be proved, that, at the same time, when the quantity of bone and offal have been reduced, that there has been, upon the whole, a greater acquisition of prime flesh and fat produced at *less expence*, than what is attained *in the common practice of the kingdom at large?* If such proofs can be adduced, they will certainly promote the ends in view much more effectually, than the *assertions of interested individuals.*

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* The number of cows kept for the dairy in Cheshire may be about 92,000; from which are probably made annually about 11,500 tons of cheese.—*Mr. Fenna.*

This calculation appears to be tolerably accurate. Estimating the number of cultivated acres of land in the county at 600,000, taking nearly a third of this number for dairy pasture, and allowing two acres to each cow, we shall approach very nearly to the statement made by Mr. Fenna of the number of dairy cows in Cheshire. Averaging the quantity of cheese made annually from each cow at 2½ cwt., the result will correspond with his calculation of the quantity made every year in the county.

Rearing.—When calves to keep up the dairies are home bred, they are generally reared from the best milkers; and this is the case with respect to bull calves, as well as heifers. Those which are reared are generally calved in February or March, and are kept on the cows most commonly for about three weeks; afterwards they are fed with warm green whey, scalded whey, and butter-milk mixed, or hard fleetings: of the latter food, about five quarts are given at a meal to each calf. With the green whey, water is frequently mixed, and either oatmeal, wheat, or bean-flour is added; about a quart of meal or flour is generally thought to be enough to mix with forty or fifty quarts of liquid, which is sufficient for a meal for ten calves: if flax seed is given, a quart of boiled seed is added to the whey, &c. for a like number of calves; oatmeal gruel, and butter-milk, with a little skimmed milk mixed in it, are also frequently used for the same purpose: some one of these foods is given night and morning; but at the latter part of the time only once a day, with few exceptions, till, and for some time after, the calves are turned out to grass, and continued in the whole for ten or twelve weeks. The first winter a good pasture is reserved for the calves, and a little hay is given to them night and morning, as soon as hard weather sets in. The second winter their dry food is straw, having an open shed, occasionally to shelter under, near their pasture; they are, however, frequently foddered with straw in the open fields.* The summer following, the heifers, at two years old off, are put to the bull. During the third winter, in some parts of the county, they lie out in the fields till near calving time: in other parts of the county, the heifers are tied up at the same time as the milking cows are: in both cases, they are fed with straw night and morning, till about a month before calving: hay is afterwards given during the whole of the time they continue to be housed, and sometimes crushed oats when they calve early.

Management of the Cows.—They are taken up into the cow-houses † about the middle of November, or as soon as the weather begins to be bad. It is commonly intended that the cows should be permitted to go dry, about ten weeks before the time of their calving; as it is thought to render them less profitable the ensuing season, if kept to their milk too long.

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* This must certainly be regarded as bad management. The plan adopted by the most intelligent dairy farmers, is to keep the cattle in a yard with an open shed, by which means they are improved, and the quantity of manure obtained is greatly increased.—*A Correspondent.*

† If the cattle were well foddered in a yard with an open shed, the superior advantages of this practice, would in all probability, be speedily perceptible.—*A Correspondent.*

The usual dry foods are wheat, barley, and oat straw, hay, and crushed oats; the two former kinds of straw are found to make cows go dry much sooner than the latter; and another generally allowed effect, attributed to such straw, is, that more than the usual time will be required to churn the cream of cows when so fed; but wheat straw is esteemed much more wholesome than barley straw, as having less of those effects attending it. Those cows which, at the time of housing, are not expected to calve till rather late in the spring, are fed with oat straw, and sometimes hay, during the time they are milked; afterwards either wheat or barley straw is given to them. The forward in calf cows, on the contrary, when taken up, are put either to wheat or barley straw, as circumstances may suit; and oat straw is not given to them till the whole of the other straw is consumed. This, however, depends upon the price of markets for grain. The straw fodder is continued in either case, till about three or four weeks before the time the cows are expected to calve: when hay is given to them, the quantity is from two to two and a half per week, per cow. From the time the cows have calved till they are turned out to grass, some ground or crushed oats are given them twice a day; generally, from twenty to twenty-five quarts per week to each cow. In years when hay has been scarce, many farmers have given chopped straw, and a little corn mixed in it, with two small fodderings only of hay per day, and occasionally a foddering of straw at night. The cows are turned into an *outlet* (a bare pasture field near the buildings) about ten o'clock in the morning, and housed again about four in the afternoon, the winter through; but have no fodder in the outlet. It is the practice of many, after the cows have been turned into the outlet, as soon as they shew a desire of being taken up again, they are let into the yard, and housed; and this in very cold, or in wet weather, must be a much better practice than suffering them, as is usually done, to stand shivering with cold in a field without shelter. Turning the cows out to grass in good condition, is a matter much attended to, in order that they may, as the term is, "start well;" for if a cow is not in good condition when turned out to grass, or has been too much dried with barley straw, it is a long time before she gets into full milk."

Green food, and Stall feeding.—The more general introduction of green crops, and of the practice of stall feeding for dairy cows, may certainly be reckoned among the most considerable improvements which have taken place of late years in the agriculture of Cheshire. With the dairy farmer, it is a principal object to increase the quantity of his milk, and to continue it as long as possible. This can in no way be more effectually done, than by giving green food to his cattle; and I am informed by several intelligent farmers, that by this management the milk may be continued a month longer in the autumn than could be effected by trusting to the pastures only for a supply of food. The importance of this circumstance, in a dairy district, must be sufficiently obvious.

The ox-cabbage and Swedish turnip are the kinds of green food most esteemed and cultivated in Cheshire. The former is usually given to the cows when the after grass is consumed; it is sometimes given in the spring to cows that have newly calved. The large sugar-loaf cabbage has been occasionally used, when the pastures begin to fail and the after grass is not ready; a circumstance which frequently happens, especially in dry weather. Turnips are given to the cattle in the winter, while they are feeding on straw; and as, at this time, no cheese is made, any objection to their use from the flavour they give to the milk, is of little consequence.

I have made inquiries from several farmers, with a view of ascertaining whether the stall feeding of their milch cows might not be continued during the whole year, but have found the general opinion to be against this practice; though it does not appear that any experiments, sufficient for the decision of the point, have hitherto been made. It has been suggested to me, however, that it would be an improvement upon the present management, to let the cows stand in their houses during the heat of the day in summer; where, by giving them a few cabbages or tares, the milk would continue forming, and the cattle be defended from the gad-fly, which, by tormenting them in the fields, frequently injures both the quantity and quality of the milk.

"The season of calving is March and April; some few cows drop their calves about Christmas and in February; and the heifers in the beginning or middle of May. In a stock of twenty cows, the ten first dropped calves, at a month old, fetched, to be slaughtered, from twenty to twenty-five shillings each; the remainder, upon an average, not more than eight shillings; for when the cheese-making season comes on, the calves, whether young or old, fat or lean, are all hurried away to the butcher. Allowing, however, for those cows which are barren, those which cast their calves, and other casualties, the average price of the calves does not amount to more than about twelve shillings, the dairy through. The quantity of land, sufficient to keep one cow the whole year, must of course vary with the quality and produce of different soils, and the size and nature of the beast: probably, on the average, having reference to the quantity of hay and corn consumed, as well as to the grass and straw, a cow, in the course of the year, will consume the produce of three statute acres of land. The quantity of cheese made per cow (varying from 50lb. to 500lb. and upwards) must also be governed by circumstances. The nature of the land, the oldness of the pastures, and the seasons, together with the wintering of the stock, have each a separate influence: on the whole, perhaps the quantity may be stated at 300lb. from each cow, *slinkers* (such as cast their calves) and bad milkers included, the dairy through.* The quantity of milk, agreeably to this estimation, if a gallon is supposed to produce a pound (sixteen ounces) of cheese, will be eight quarts a day each cow, for twenty-two weeks (nearly) through the dairy. It must, however, be understood, that a number of the cows (which has been intimated before) continue in profit till about ten weeks before the time of calving. There are cows that will give twelve quarts of milk twice a day, for three or four months together; but it is remarked that these cows, who give much more than eight quarts at a meal, either go off their milk much sooner, or else their milk has less richness in it, than that of others who do not give so large a quantity."

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* In the hundred of Wirrall, where there is a dairy on most of the farms, the average annual produce of cheese from each cow cannot be stated at more than 2 cwt. This deficiency originates in several obvious causes; few of the pastures in this district are old grass land; they are in general very fully stocked with cattle; to the breed and condition of which, too little attention is usually paid by the farmer. The neglect of giving turnips, or some other description of green food to the cows in the months of October and November; and their bad wintering, which is, for the most part, of straw only, are additional circumstances, which account in a great measure for the comparative smallness of produce from the cattle on the Wirrall dairies. *Rev. R. Jasson.*

"*In the Management and Care of a large Dairy of Cows*—(or a pack of cows, as is the term in Cheshire) a constant and almost unremitting attention is required. At calving time the cow-man, or the master, are frequently up two or three times in the course of a night, to see whether any thing is amiss. The racks and mangers are every day well cleaned out; due attention is paid to the appetites of the different beasts, and the quantity of food is governed accordingly. After this is done, the master himself, generally, goes round from stall to stall just before bed time, and adds to or diminishes the quantity of fodder as occasion may require."*

THE DAIRY MANAGEMENT, &c.

Milk Butter.—"There does not appear to be any thing particularly worthy of notice, in the process of making butter, unless it be the common practice of churning the *whole milk*, instead of setting up the milk for the cream to rise, and churning it alone, as is the custom in most other parts of the kingdom. In Cheshire, the whole milk (viz. cream, and all without being skimmed) is churned together; and preparatory to that, the meal is immediately, after milking in summer, cooled in quantities proportioned to the heat of the weather, previous to its being put together, which from time to time is done in earthen cream mugs or jars. In these jars (containing four or six gallons each) it is intended to stand till it is *carved* (as the term is), or clotted in a proper degree for churning, and this is judged to be the case, sufficient for the intended purpose, as soon as the whole is coagulated, and has acquired a small degree of acidity, which will generally take place in warm weather, in the course of a day or two. In winter, the cream mugs are placed near a fire, to forward the *carving* or clotting of the milk. If the milk, in warm weather, has not been sufficiently cooled before it is put to the former meal, or if in winter the mugs have been set too near the fire, it curdles the whole mass, making it (as the phrase is) "go all to whig and whey," and afterwards heave in the mug. Again, if in summer, or, when kept in a warm situation, the milk is not churned within a day, or a little more, after it is sufficiently *carved*, a kind of fermentation and heaving also ensues; in both cases, the butter will be rank, and ill tasted; nor will the milk produce so much butter, as when it has been properly managed, and churned in proper time. We do not find that any comparative experiments have in this part of the country been made, so as to ascertain, with any degree of certainty, which of the two common modes of obtaining butter is best, in regard to quantity, flavour, &c. This matter, however, well worth attending to, might easily be ascertained by experiments both simple and unexpensive. In most parts of Cheshire,

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* "In the choice of persons for milking the cows, great caution should be employed; for if that operation be not carefully, and properly performed, the quantity of the produce of the dairy will be greatly diminished. It should be a rule never to allow this important department to be entrusted, without controul, to the management of any, but very trusty servants, as the cows should always be treated with grea gentleness."

shire, butter is made up for sale in lumps, that have the term *dishes* applied to them; the weight of a *dish* is one pound and a half, or twenty-four ounces."

"The churns in common use are of the upright kind, and have, in some instances, a lever applied to them: when that is the case, one end of the lever (which is supported by an upright frame) is connected to the end of the churn staff; the other end of the lever, by means of a rod, is connected to a crank in a toothed wheel, and this is worked by a pinion fixed upon the axis of a common winch. By means of this contrivance, the business of churning is performed by one person with the greatest ease."*

Whey Butter.—"It may not be improper to explain, that what is here called *green whey*, is the clear whey which is taken from the curd out of the cheese tub; the *white whey* is what is pressed out of the curd by hand, &c. after being put into the cheese vat: the general term of whey is given only to such part of the liquid as remains after the fleetings (made by scalding the whey) have been skimmed therefrom. In the process of making whey butter, in some instances, the *thrustings*, or white whey, is set in *cream mugs* to *carve*, and acidulate for churning, either by the warmth of the season, or of a room, in the same manner as in the mode described for making milk butter. In other instances, the green and white whey are both boiled together for fleetings (the account of which follows): in this case, or when the green whey is boiled alone (the boiler, if an iron one, being previously rubbed with butter, to prevent the whey from catching, or acquiring a burnt like taste), such a fire is kept, as will make the whey as hot as possible, without boiling*; and as soon as they have acquired that degree of heat, the buttery matter, which the whey contains, will break, or separate from it, and rise to the surface. This generally takes place in the course of about an hour; but when the whey is perfectly sweet, a little souring is sometimes added, to produce the breaking effect. In other respects, the process of making whey butter is the same as that of milk butter."

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* I have met with one farmer who employs a small water wheel to work his churn; by means of which he can make the churn-staff work at pleasure from 1 to 108 strokes in a minute. He has experienced the greatest advantage from this mode of churning, and recommends its adoption whenever the situation of the dairy will admit of it.

Scalding Whey.—" The whey, when taken out of the cheese tub into brass pans, or other convenient vessels, is suffered to stand about a quarter of an hour; when it is put out into other vessels, in which vessels it again stands as long, and is then poured into the furnace pan. In each of these intervals, it deposits a sediment of curd, which is collected in the bottoms of the vessels, and returned to the mass of curd in the cheese tub."

" That whey which drips into the tub while the cheese is pressed over it, is always kept by itself, and set by till it is at least a day old; as soon therefore as the green whey, in the furnace pan, becomes so hot as to throw up a little white froth, or foam (it must not boil), the *thrustings* of the preceding day are put into it (unless, as before stated, they are otherwise disposed of): these cause the whey to break, and throw up a substance, something in appearance between cream and curd, which is constantly skimmed off, as long as it rises, and put into the cream mugs to be churned for butter."

" This whey cream, as it is called, is churned up thrice a week, and the average produce of butter which it yields, from one dairy cow, is from eight to ten ounces weekly. The difference of price between this and milk butter is generally from one penny to two-pence per pound. As soon as the whey is exhausted of its cream, about two quarts of butter-milk is poured into it, which again breaks into what are called *fleetings* or *flit milk*, and these are skimmed off, for the use of the servants, &c. &c. As it is matter of surprize to many, that so few pigs (about one pig and not more, weighing about 18 scores when fat, is usually fed from the remaining offal of every eight or ten cows) are kept on Cheshire dairy farms, it may not be improper to observe, that except in corn harvest, the produce of the dairy, such as whey, butter-milk, and fleetings, is the constant beverage of the servants and labourers; and to this consumption may be added the constant aid of *supping*, as it is called, which each dairy furnishes daily to the numerous cottagers around, who fetch it from the houses."

CHESHIRE CHEESE MAKING.*

" It is not supposed, that any improvement of consequence has taken place in cheese-making during a great length of time, except only the improved method of preparing steep. In all dairies, the same points are admitted to be the essential; but although the means of attaining those points are, upon farms similarly circumstanced, so far alike, as to differ materially in the minutiæ only, yet upon those minutiæ much of the art of cheese-making depends."

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* " The whole of this account refers to cheese of 60lbs. weight.—Cheese of this weight is susceptible of every excellence to be found in Cheshire cheese.

"That an exact uniformity does not prevail, in every part of the process, is no wonder; for there is not any of the business which is conducted in a dairy, that tends in the least to chemical exactness. Where there is no precision, there can be no just comparison; and where no comparison can be made, there exists no foundation for an attempt at uniformity. The degree of heat at setting the milk together, is never measured; the quantity of steep is guessed at, and its quality not exactly known; the quantity of salt necessary is undefined; and the *sweating* or fermenting of the cheese, when made, is accidental. Under these circumstances, we cannot help expressing, by the way, a wish that a cheese farm of experiment might be established in this county, under the patronage of the Board of Agriculture, and under the management of a person well skilled in chemistry, that something like scientific principles might be discovered, on which to conduct the process."

"*Rennet or Steep*—is an infusion of the prepared stomach of a sucking calf, usually called the bag or maw-skin: in order to have this in perfection, the calf should have lived on new milk only, and be quite in health at the time of being killed. Under these circumstances, the maw-skin is always found to contain, when taken out of the calf, more or less of a firm, white, curd-like matter. This chyley matter is frequently salted for present use, and is generally esteemed a proof of its being a good skin; but this proof of excellence is not always to be depended on. When calves are sold, it is the custom of Cheshire to have the maw-skins returned;

turned; and it is also customary for those farmers who live near to a butcher's shop, to attend the killing of calves, in order to choose the best. If the skins of their own calves prove bad ones, they pick those that have curd in them, and taking it out, put it into such of their own skins as happen to have none of it, and leave the empty ones for somebody else. Amongst imported skins, the farmers often meet with those of lambs and kids which answer the intended purpose but indifferently."

Preparation of the Maw-Skin.—"When it comes from the butcher, the chyley matter is taken out, and the skin cleared from slime and every apparent impurity, by wiping or a gentle washing; the skin is then filled nearly full of salt, and placing a layer of salt upon the bottom of a mug, the skin is laid flat upon it; the mug is large enough to hold three skins in a course: each course of skins should be covered with salt, and when a sufficient number of skins are thus placed in the mug, that mug should be filled up with salt, and with a dish or slate over it, be put into a cool place, till the approach of the cheese-making season, in the following year. The skins are then all taken out, laid for the brine to drain from them, and being spread upon a table, they are powdered on each side with fine salt, and are rolled smooth with a paste roller, which presses in the salt; after that, a thin splint of wood is stuck across each of them, to keep them extended while they are hung to dry."

Milk-House.—"A northern aspect is the best for a milk-house, and it should be so sheltered by buildings or trees, as to keep it from the rays of the sun during the whole day. The perfection of a milk-house is to have an uniform temperature in its contained air, the whole year round. If this is not attainable, recourse must be had in hot seasons to cold spring water, which should be daily and plentifully poured on the floor; nor is cleanliness, at any time, in any of the departments of the business to be neglected."

Milking.—" The hour of milking, during the summer season, is six, both night and morning. It is a general and very prudent practice for the farmer himself to attend the milking, to assist in carrying the milk into the milk-house, and to see that the cows are properly dripped; for as each succeeding drop which a cow gives at a meal exceeds the preceding one in richness, it is an important point to have the cow's bags completely emptied, and the more particularly so, because if that is not done, it has a tendency gradually to make them go dry. The milking pails, commonly used, will hold about two gallons each, which, when full, are emptied into a bowl or large wooden vessel, that will contain three such pails full, and in that the milk is carried to the milk-house, where it is poured through a sieve into a leaden milk cooler. The sieve is supported over the cooler by a cheese ladder. This cooler is framed on legs like a table, on the top of which legs is a leaden cistern about nine inches deep, five feet long, and two feet and a half wide. In the bottom of the cistern is a vent hole, to which is fitted a wooden spiggot, or plug. In some dairies, there are coolers sufficient to hold a full meal's milk. In this case the milk stands in them all night, and after its cream is skimmed off in the morning, it is drawn out through the vent hole, into brass pans, and so carried into the cheese tub. Where there is only one cooler, and that insufficient to hold a meal's milk, the milk is drawn off into pans as soon as the cooler is full, which is again filled as it is brought to the house, observing to leave the milk, last brought in, to stand in the cooler all night. The expeditious cooling of the milk has considerable influence in preventing its tendency to acidity in the heat of summer. When the weather is cold, the use of the leaden cooler is generally set aside."

" If milk was repeatedly drawn off into pans, and again returned into the cooler until quite cold, perhaps the quality of the cheese might thereby be improved, and the difficulty in making it be lessened."

Quality of Milk.—" Cheshire cheese is generally made with two meals milk, and that in dairies where two cheeses are made in a day. In the beginning, and end of the season, three, four, and even five or six meals milk are kept for the same cheese. It is difficult to say what proportion of the cream is withheld from the milk, before it is put together; the quantity may be varied, either through supposed judgment and skill in the art, or from other motives. The general custom, however, in the best dairies, is to take about a pint of cream, when two meal cheeses are made from the night's milk of twenty cows. In order to make cheese of the best quality, and in the greatest abundance, it is admitted that the cream should remain in the milk ; but whether the cream that is once separated from it, can by any means be again so intimately united with it, as not to undergo a decomposition in the after process, admits of some doubt. There is, at least, no absurdity in attempting to prevent the separation of two bodies, which it is our professed intention to unite again. If a cheese, made entirely of the night's milk, on which the cream has risen, be as rich as one made of new milk, all other circumstances being alike, it is a proof that milk and cream, after being separated, may, by heating only, become, as it were, new milk again. Experiment alone can decide this point; but the practice here is to unite the milk and cream, as will be shewn hereafter; and the dairy-men say, that when so united, it differs not from new milk, as to the purposes of cheese-making."

The common Mode of making the Steep.—"In the evening, part of a dried maw-skin is cut with a pair of scissars, and put into half a pint of luke warm water, to which is added as much salt as will lie on a shilling. In the morning, this infusion (the skin being first taken out) is put, as hereafter mentioned, into the cheese tub of milk; but so great is the difference in the quality of these skins, that it is difficult to ascertain what quantity will be necessary for the intended purpose. A piece, the size of a half-crown, cut from the bottom end of a good skin (the bottom end being strongest) will commonly be enough to give sufficient strength to the coagulum for a cheese of 60lb. weight; although ten square inches of skin are often found too little."

"It is customary to cut two pieces for each cheese; one from the lower, the other from the upper part of the skin. The cup, in which this skin is infused, ought to be well scalded every day."

Improved Mode of preparing Steep.—Take all the maw-skins provided for the whole season, pickled and dried as before; put them into an open vessel or vessels, and for each skin pour in three pints of pure spring water; let them stand twenty-four hours; then take out the skins, put them into other vessels; add for each one pint of spring water, and let them stand twenty-four hours as before: on taking the skins out the second time, gently stroke them down with the hand into the infusion. The skins are then done with. Mix those two infusions together, pass the liquor through a fine linen sieve, and add to the whole a quantity of salt, rather more than is sufficient to saturate the water, viz. until a portion of salt remains undissolved at the bottom of the vessel. The next day, and also the summer through, the scum, as it rises, is to be taken clearly off, and as the liquor should not be suffered to remain, without a portion of undissolved salt at the bottom, it will be necessary frequently to add fresh salt, as that which was dissolved will gradually form itself into crystals, and be taken off with the rising scum. Somewhat less than a wine half pint of this preparation will generally be sufficient for 60lbs. of cheese. Whenever any of this liquid is taken out for use, the whole should be well stirred up."

Colouring.—"The colouring for cheese is, or at least should be, Spanish arnotta; but as soon as colouring became general in this country, a colour of an adulterated kind was exposed to sale in almost every shop. The weight of a guinea and a half, of real Spanish arnotta, is sufficient for a cheese of 60lbs. weight. If a considerable part of the cream of the night's milk be taken for butter, more colouring will be requisite. The leaner the cheese is, the more colouring it requires. The manner of using arnotta is to tie up in a linen rag the quantity deemed sufficient, and put it into half a pint of warm water over night: the infusion is put into the tub of milk, in the morning, with the steep infusion, dipping the rag into the milk, and rubbing it against the palm of the hand as long as any colour comes out."*

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* It has been calculated, that not less than 5 or 6000l. is annually paid in Cheshire, for arnotta, for the colouring of cheese. If the gentry would prefer, and be particular in ordering for their own table, cheese that

Setting the Cheese together.—"It is, we believe, generally admitted, that not only the quantity, but the quality of the curd, as to texture (viz. toughness, or otherwise), depends in a great measure upon the length of time the cheese is in coming, and that the time again depends on the quantity and strength of the coagulum used, the state of the atmosphere, and the heat of the milk when put together. In this stage of the art, where a degree of accurate certainty seems to be required, there is no other guide but the hand, and the external feelings: the thermometer of a Cheshire dairy-woman is constantly at her fingers ends. Accordingly, the heat of the milk, when set, is endeavoured to be regulated by the *supposed* warmth of the room, and the heat of the external air (having reference also to the quantity, and strength of the steep), so as that the milk may be the proper length of time in sufficiently coagulating, which is generally thought to be about an hour and half. The evening's milk (of suppose twenty cows) having stood all the night in the cooler and brass pans, the cheese-maker (in summer), about six o'clock in the morning, carefully skims off the cream from the whole of it, observing first to take off all the froth and bubbles, which may amount to about a pint: this not being thought proper to put into the cheese, goes to the cream mug to be churned for butter, and the rest of the cream is put into a brass pan. While the dairy-woman is thus employed, the servants are milking the cows, having previously lighted a fire under the furnace, which is half full of water. As soon as the night's milk is skimmed, it is all carried into the cheese tub,

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that is not coloured, that ridiculous, and completely unnecessary expense would probably, in a great measure, be done away. *Mr. Fenna.*

except about three-fourths of a brass pan full (three or four gallons), which is immediately placed in the furnace of hot water in the pan, and is made scalding hot; then half of the milk thus heated in the pan is poured also into the cheese tub, and the other half is poured to the cream, which, as before observed, was skimmed into another brass pan. By this means all the cream is liquefied and dissolved, so as apparently to form one homogeneous or uniform fluid, and in that state it is poured into the cheese tub. But before this is done, several bowls or vessels, full of new milk, will generally have been poured into the cheese tub, or, perhaps, the whole morning's milk. Care is taken to skim off all the air bubbles which may have formed, in pouring the new milk into the cheese tub."

Variations.—"In many celebrated dairies, during the whole summer, they do not heat a drop of the night's milk; only dissolve the cream in a brass pan, floated or suspended in a furnace of hot water; and this (we are credibly informed) was the practice of a person, who made more than five hundred weight of cheese of the very best quality per cow (of 120 pounds each hundred) in one season. In other dairies, they heat one third, one half, and even more than that of the previous night's milk. In all dairies, they are careful to liquefy or melt the cream well, before it is mixed with the milk in the tub. But whatever may be the custom of heating or not heating milk in any given dairy, the practice of that dairy varies as the weather becomes hot, cold, gleamy, or sultry, &c. We have sometimes cold chilly mornings, even in July, which compel the heating of milk in dairies, where the custom is not to heat it. Again, in the last summer, milk put cool together, from the warmth of the weather, heats in the tub, so as to render the process difficult; and this in dairies where the usual practice is to heat half the night's milk. It is generally on poor clay lands, that the milk most requires warming: on good rich soils the milk will not bear much heating; at least, by so doing, the process of cheese-making is rendered more difficult. The lowest degree of heat on setting together, viz. putting the milk into the cheese tub, is one half cooler than milk from a cow; the highest about twice the warmth of that animal's milk; and this is meant as the practice in *summer*, speaking *generally*. But whatever may be the degree of heat supposed most proper for any particular dairy, the night's and morning's milk, and melted cream, being all put into the cheese tub, it is then ready to receive the rennet and colouring, or in the terms of the art, *to be set together*.

" The rennet and colouring being put into the tub, the whole is well stirred together; a wooden cover is put over the tub, and over that is thrown a linen cloth. The usual time of *coming* is one hour and a half, during which time it is frequently to be examined: if the cream rises to the surface, before the coming takes place, as it often does, the whole must be stirred together so as to mix again the milk and cream, and this as often as it rises, until the coagulation commences. A few smart strokes on different sides of the tub, with the cheese ladder, &c. will forward the coagulation, if it is found to be too long in forming. If the dairy woman supposes the milk, &c. to have been accidentally put together cooler than she intended, or that its coolness is the cause of its not coming, hot water, or hot milk, may be poured into it, or hot water in a brass pan partially immerged therein. But this must be done before it is at all coagulated; for after that takes place, though but imperfectly, it must not be tampered with so as to break the forming curd: a considerable part of the cream would thereby be diverted into the whey, and the quantity of curd much lessened. Before the coagulation takes place, an additional quantity of rennet may also be put in, if thought necessary; but this will, after coagulation, be added with little effect, as no means can be used to mix it with the whole mass, without disturbing the forming curd. If the cheese has been set together hotter than it was meant to be, the opposite means, under the same precautions, may be recurred to. But the more general practice is, to suffer the process to proceed, hot as it is, until the first quantity of whey is taken off; a part of which, being set to cool, is returned into the tub to cool the curd. When the cheese happens to come much sooner than the proper time, owing to too great a degree of heat in the milk on setting or putting together, or to too great a strength of steep, there is less curd; and it is considerably tougher, than when the milk has been set cooler together than usual, or when rather too little steep has been used. In the latter case, the curd is exceedingly tender; and when that happens, a part of the whey is taken out of the cheese tub, and heated as much as may be thought sufficient, to give to the curd, on being mixed with it, a proper degree of toughness. In an hour and a half (as mentioned before) if all goes on well, the coagulation will be formed. This point is determined by gently pressing the surface of the milk with the back of the hand. Experience is the only guide in this test, for the firmness of curd will, (as before stated) from the milk set hot together, be much greater than that from milk which has been set cold together. Another criterion, to judge whether the milk be sufficiently coagulated, is, to lift up the skimming dish, which is always left inverted on the surface of the milk. If the cheese be properly come, the whey and curd will distinctly appear where the skimming dish lay.

"*Breaking down the Curd and gathering, &c.*—If the milk has been set together very warm, the curd (as before observed) will be firm; in this case, the usual practice is to take a common case knife, and make incisions across it, to the full depth of the knife blade, at the distance of about one inch, and again crosswise in the same manner; the incisions intersecting each other at right angles. The whey rising through these incisions is of a fine pale green colour. The cheese-maker and two assistants then proceed to break the curd: this is performed by repeatedly putting their hands down into the tub (the cheese-maker with the skimming dish in one hand), and breaking every part thereof as they catch it; raising the curd from the bottom, and still breaking it. This part of the business is continued till the whole is broken uniformly small: it generally takes up about forty minutes, and the curd is then left covered over with a cloth for about half an hour, to subside.

"If the milk has been set cool together, the curd will (as mentioned before) be much more tender; the whey will not be so green, but rather of a milky appearance. The cheese-maker, in this case, instead of the knife, has recourse to the skimming dish, the edge of which she holds perpendicular to the surface of the whey in the tub, and dips it gently an inch or two into the curd, and turns it over, until the whole surface is thus turned. The breaking then proceeds as before, but a cautious and gentle mode of doing it is more necessary than in the former case. Rather more time, of course, is requisite for breaking down a cold, than a hot cheese; but when sufficiently broken, it is covered over, and left to subside as before. After standing about half an hour, as much whey is taken out of the tub into the brass pans, as conveniently may be, without taking any of the curd with it. In some dairies this whey is occasionally heated, in others cooled (or at least a part of it) and returned into the cheese-tub again, as the weather or other circumstances may require. In general, however, it is not returned to the curd, but the whey being laded out of the tub, the breaking recommences as before for about a quarter of an hour; it is then left to settle for a few minutes, when the whey is again laded out with the former precaution.

" The bottom of the tub is now set rather atilt, the curd is collected to the upper side of it, and a board is introduced, of a semicircular form, to fit loosely one half of the tub's bottom. This board is placed on the curd, and a sixty pound weight upon it, to press out the whey, which, draining to the lower side of the tilted tub, is laded out into brass pans. Such parts of the curd as are pressed from under the board, are cut off with a knife, placed under the weighted board, and again pressed. This is repeated again and again, the whey being constantly laded out as it drains from the curd. The whole mass of curd is then turned upside down, put on the other side of the tub, again pressed, pared, and pressed as before. The board and weight being removed, the curd is cut into several pieces of about eight or nine inches square, piled upon each other, and pressed with the board and weight; repeating the cutting and piling, as long as any whey drains from it. A stranger to the business would conclude that much stress was laid upon breaking the curd, just on the surface of the whey; for he observes that the whole of the curd is broken there, and the palms of the women's hands, being turned upwards, keep continually raising, and buoying up a portion of curd to the surface, with a seeming intention to delay the crushing of it, until it floats upon the top; but this circumstance is owing to the lightness of the curd in that state, which on this account escapes the grasp, until it comes in contact with a lighter medium, the air. It scarcely need be added, that the more gently the whole of the business in the tub is performed, the more perfect will be the separation of curd and whey. The next thing is to break the curd in a brass pan. After being pressed in the tub as long as any considerable quantity of whey drains from it, the curd is cut into three nearly equal portions, one of which is taken into a brass pan, and is there by two women broken exceedingly fine. As soon as it is coarsely broken, a large handful of salt is added, which in the subsequent breaking is well mixed with the curd; that portion of curd being sufficiently broken, is put into a cheese vat which is placed to receive it, on a cheese ladder over the cheese tub. The vat is furnished generally with a coarse cheese-cloth. The second and third portions of the curd are treated in the same manner, and emptied into the vat; except, that into the middle portion, eight, nine, or ten times the quantity of salt is usually put. By some dairy-women, however, each portion is salted alike, and with no more than three large handfuls to each. The breaking takes up more or less time, as the cheese was set together hotter or colder; half an hour is, perhaps, the longest time.

"*Thrusting, or hand-pressing the Cheese in a vat.*— The curd, when put into the cheese-vat, in its broken state, is heaped above the vat in a conical form; to prevent it from crumbling down, the four corners of the cheese-cloth are turned up over it, and three women placing their hands against the conical part, gently, but forcibly, press it in near a horizontal direction, constantly shifting their hands when any portion of the curd is starting from the mass, and turning down and folding up the cloth as occasion requires. As soon as the curd adheres together so as to admit it, a small square board, with a corner of the cloth under it, is put on the top of the conical part of the curd, with a sixty pound weight upon the board. Several iron skewers are, at this time, stuck in the cone, and also through holes in the side of the vat. In many dairies, a lever is used to thrust or press the cheese; this is a long substantial pole, one end of which is fastened in the wall, in a direction nearly parallel to the top of the cheese, on which (the cheese) a small board is placed to receive the lever. The power gained by it is used at discretion. In other dairies, they use thrusting screws, which are fixed to the floor above, the power whereof may be regulated at pleasure. The employment of the women is now that of drawing out and putting in the skewers, thrusting and keeping together the portions of curd that the power of the weight or lever, &c. displaces. This operation is continued till the whey, which at first ran from it freely, begins to be discharged by drops; the weight, &c. and skewers are then removed, and one woman takes up the corners of the cloth, while the others break the curd, half way to the bottom of the vat, as small as they can. Some people use a wooden or tin hoop, about nine inches broad, instead of holding up the corners of the cloth, during this breaking. After the upper half of the cheese is thus broken, it has again a weight, or other power, applied to it, and is skewered and thrusted as before; at first the whey again runs freely, and the operation is continued as long as those means will press out a drop of whey. Two of the women then take the four corners of the cloth, (the skewers, &c. being removed) and the other women lay hold of the vat, which is drawn from the cheese, and after rinsing it in warm whey, and putting another clean cloth over the upper part of the cheese, it is returned inverted into the vat again; and being placed on the ladder over the tub, is broken half way through as before: the thrusting, weighting, and skewering, &c. is repeated, and continued from two to four hours, or as long as a drop of whey can be extracted from the cheese. In the practice of some dairywomen, some spare curd is kept to mix with the following day's cheese, from an opinion that it will prevent the cheese swelling under the press, &c. But, on the whole, this method is seldom practised.

" *Putting the Cheese into the Press, &c.*—When no more whey can be extracted by the use of these means, the cheese is again turned in the vat, and rinsed as before in warm whey. The cloth, now made use of, is finer and larger than the former, and is so laid, that on one side it shall be level with the edge of the vat, and on the other wrap over the whole surface of the cheese, and the edges put within the vat; thus perfectly inclosing the whole cheese in the cloth. In this stage of the business the cheese is still higher than the edge of the vat; and to preserve it in due form, recourse is had to a tin binder or hoop, about three inches broad, which is put round the cheese, on the outside of the cloth, and the lower edge of the binder pressed down within the vat, so low as that the upper edge of it may be level with the surface of the cheese. The cheese is then carried to the press, and a smooth strong board being placed over it, the press is gently let down upon it; the usual power of which press is about fourteen or fifteen hundred weight. In most dairies there are two presses, and in many three or four, of different weights. The cheese is, by some, put under the heaviest press first, and by others under the lightest. Some dairy-women, instead of the tin binders, use cheese fillets, which are a strong, broad, coarse sort of tape; one end of which they thrust down with a thin wooden knife between the cheese-cloth and vat, and then draw it tightly several times round the cheese, and fasten it with strong pins. As soon as the cheese is put into the press it is immediately well skewered. The skewers are of strong iron wire, eighteen or twenty inches long, sharp at the points, and turned with a bow at the other end. The vat and tin binder have holes to receive these skewers, especially the binder; which holes are seldom more than an inch from each other. As the press always stands close to a wall, only one side of the cheese can be skewered at a time on that side; therefore, as many skewers are stuck in different directions, as conveniently may, leaving as many holes unskewered as are skewered, to give an opportunity of changing the holes. The business of skewering continues till the next morning, at six o'clock, and in that time the oftener they are shifted, the better: every second time of shifting them, the cheese is turned half way round in the press, to come at the other side of it. In half an hour from the time the cheese is first put into the press, it is taken out again, and turned in the vat, into another clean cloth. At this time the edges of the cheese are pared off, if they have become sharp under the press (but as the vats are now usually made with the angles rounded, the paring is rendered unnecessary), the vat being wiped dry before the cheese is returned to it. When the cheese is thus a first time taken out of the press, it is the custom in some places to put it naked into warm, and, in other places, into hot whey, where it stands an hour or more; it is then taken out, wiped dry, and after it has stood till cool, is returned to the press. This is done with a view of hardening its coat, that it may stand the better. By rarefying the air near the surface of the cheese, it perhaps may cause its discharge, and prevent blisters. At six o'clock in the evening the cheese is again turned in the vat into another clean cloth. At this and the former turning, some dairy-women prick the upper surface of the cheese all over, an inch or two deep, before it is replaced under the press, with a view also of preventing blisters. At six o'clock in the morning it is again turned in the vat, with a clean cloth as before. The skewers are now laid aside. When the next day's cheese is ready for the press, the former one is again turned in the vat, with a clean cloth, and put under another press. At six o'clock in the evening, and at six in the morning following, it is again turned in the vat, using at these two last turnings two cloths finer than those which were before used, in order that as little impression as possible from the cloth may remain on the coat of the cheese.

" *Salting-House.*—At noon the cheese is taken from the press (after having been there about forty-eight hours), a fresh fine cloth being put under it, which serves only as a lining to the vat, and is not turned over the upper surface of the cheese, as has been hitherto the case.

" It is then taken and placed nearly midside deep in brine, in a salting tunnel or tub; the upper surface of the cheese being covered all over with salt. It stands generally about three days in the salting tunnel, is turned daily, and each turning well salted; the cloth being twice changed in the time. The cheese is then taken out of the vat, in lieu of which a wooden girth, or hoop, is made use of, equal in breadth to the thickness nearly of the cheese: in this it is placed on the salting benches, where it stands about eight days, being well salted all over, and turned each day. The cheese is then washed in lukewarm water, and after being dried with a cloth, it is placed on the drying benches, where it remains about seven days: it is then washed in warm water, as before, with a brush, and wiped dry with a cloth. After it has stood about two hours from this washing, it is smeared all over with about two ounces of sweet whey butter, and then placed in the warmest part of the cheese room.

"*Variation of Management.*—On the cheese coming into the salting-house, it is, in some dairies, taken out of the vat, and after its sides are well rubbed with salt, is returned into the vat, with a clean fresh cloth under it; the top being covered with salt, it is placed on the salting benches, turned and salted twice a day, and the cloth changed every second day. On the salting benches it is continued seven or eight days, when it is taken out of the vat, and with a wooden hoop round it, or cheese fillet, is put into the salting tunnel, and managed therein as before described. When cheese is salted on the benches, before it goes into the tunnel, it is only washed once, viz. before it is smeared with butter.

"*In the Cheese Room.*—During the first seven days, it is every day well rubbed all over, and generally smeared with sweet whey butter; afterwards, a circular space is left, unrubbed, of four or five inches diameter, in the centre of each side of the cheese, which, as long as it is afterwards kept, is, or should be, turned daily, and rubbed three times a week in summer, and twice in winter. Scraping the rind should be rendered unnecessary by frequent cleanings. In a warm room, the coat will easily be prevented from rising.

"The cheese rooms are commonly placed over the cow-houses; and this is done with a view to obtain that moderate and necessary degree of temperature so essential to the ripening of cheese, to which the heat arising from the cattle underneath, is supposed very much to contribute.

"The most desirable covering for a cheese room, as contributing to that even temperature so much desired, is thatch, for reasons that must be obvious. Before the cheese is brought into the rooms, the floors are usually well littered with what the farmers here call *sniddle;*[*] though wheat straw is frequently made use of for this purpose; but the knots of it are apt to leave an impression in the cheese. The aftermath of grass, well dried, seems to be a good substitute for sniddle. The labour of turning and cleaning cheese is performed almost universally by women; and that in large dairies, where the cheeses are upwards of 140lb. each, upon an average: this they do without much appearance of exertion, and with a degree of ease, which is matter of surprise even in this county."

MISCELLANEOUS OBSERVATIONS AND OPINIONS.

"Cracks in cheese are supposed to be owing to the use of lime as a manure;[†] to their being exposed, at any time after taking out of the press, to a current of air; but especially if so exposed, before they have sweated in the cheese-room.

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[*] Coarse grass or rushes.

[†] The supposition that the cracks in cheese are owing to the use of lime as a manure, seems in the highest degree improbable.—*A Correspondent.*

"*Pungency and Rankness*—are generally attributed to the impurity of steep; or which is nearly the same thing, to a neglect in scalding the steep-cup every day. Many ascribe it to the want of salt, as others think, unjustly.*

"*Hove Cheese.*—This is an imperfection derived from flatulence, as the general cause. The sweating of cheese is, undoubtedly, a fermentation, and if this process of nature has been regular and complete, the flatulence is thereby expelled, and cheese is never subject to heave afterwards.

"But if the fermentation, or sweating, has been imperfect, which may happen from a variety of causes, indeed from all the causes that check other fermentations, the cheese will be liable to become *hove* at any time; by the approach of a thunder cloud, by sudden changes of the weather from dry to rain; which effecting an alteration in the state of the air contained in cheese, will cause those to heave the most, in which the most impure air abounds: this is the case in cheese made from *rich*, and, at the same time, *various* herbage; but more especially *clover*, though the cows should pasture *uniformly* upon *it*. Hence it appears advisable, to get the cheese to sweat as soon as may be, after it comes into the cheese-room, as that is the only method to prevent the possibility of heaving, if it be flatulent.

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* Pungency, rankness, heaving, and running out at the sides, may all be ascribed to the imperfect separation of the curds and whey. To the same cause may be attributed the defects in spongy, eyey, and whey springy cheese: from the whey not being properly discharged, a fermentation takes place, and consequently a slight degree of putrefaction. *Mr. Fenn.*

"It is strange, however, that so far from any means being used to give a cheese-room the temperature most favourable to fermentation, nothing has been done to ascertain the degree of heat which usually prevails in it. Every dairy should be furnished with a regular sweating-room. When a cheese is made, there is certainly a specific time when its contained air and juices incline to fermentation; and that natural tendency should at that time be assisted. At present, the whole is left to chance; and at the very period, probably, when a cheese is beginning to ferment, the weather becomes suddenly cool; if the process is then checked, the inclosed air becomes putrid, especially if the cheese has been ill made; and the next fermentation is really putrefactive.

"It must be admitted, that the more perfectly the whey is got out of the cheese, by skewering, thrusting, and pressing, the less air will be left in it, and less will be the probability of air generating in the cheese. Perhaps cheese would be less subject to heave, if it were made of all cold, or all warm milk; viz. of one equal temperature, as the mixing of warm and cold fluids together generates air. The usual remedy for this evil (heaving) is to weigh it down.

"*Blisters*—are supposed to be owing to the same causes as the former defect, but they are only a cuticular affection. The remedy is to open the blisters with a sharp pen-knife, and pour hot water into the incision; then press down the outer rind, put on a little salt, and place a piece of slate and a half-pound weight upon it.

"*Running out at the sides.*—This is derived from the same cause as heaving. A cheese that runs out at the sides is supposed to have been short of pressing: the remedy is to bind it round tightly with a cheese fillet.

" *Sourness.*—In hot weather it requires circumspection to prevent the milk from becoming acid, before it goes into the cheese-tub; especially in ill situated milk-houses. Sometimes when the cheese is long in coming, it will turn sour even in the tub, and for this there is no remedy but previous care.

" *Spongy, Eyey, and Whey-springey Cheese.*—These faults do not arise from want of skill in the maker, but from the grossest laziness and inattention; such defects are seldom heard of in Cheshire. The certain preventatives are careful breaking, good thrusting, frequent skewering, and powerful pressing.

" *The Milk of Cows*—which have newly calved, if the quantity of it be considerable, has a tendency to cause the cheese to heave: the first meal's milk that goes into the cheese-tub, is generally the sixth or seventh from calving. Others never having observed this tendency, always put the third meal from calving into the cheese-tub.

" *Pastures.*—The frequent change of pasture is thought to be very material to the milk product of cows. In the height of summer, they have frequently a day-pasture and a night-pasture; and this regulated by the circumstances of water and shade; but there are those who prefer a range of pasture, and a frequent change also, as most desirable for milking cattle.

" *Salt.*—Twenty-eight pounds, or half a bushel per week, on the average, is sufficient through the summer for dairies where sixty pound cheeses are made, including the other domestic uses of a moderate sized family.

mily. The greatest quantity of salt expended on one sixty pound cheese, that we have heard of, is about three pounds; but how much of that actually remains in the cheese, no one is able to say: of the salt put in it when breaking, much is discharged by the thrusting, &c. Whether it acquires much saltness in the salting-house, dairy-men themselves are doubtful, although much salt is there expended; but there cannot, we think, be any doubt, that the greatest quantity of salt ever used in cheese is insufficient to effect the purpose for which it is intentionally used, which is an antiseptic. According to Dr. Pringle (see his Observations on Diseases of the Army) it must act as a septic: experience, or at least the common practice and opinion seem to contradict the unqualified assertion, "that salt promotes the putrescency of cheese:" but that it does promote it (though at the same time it may vary the natural process of putrefaction in cheese), is an opinion, perhaps, well founded. The putrescency, or ripening of cheese, we therefore conclude, to depend much upon salt; but this is a subject that merits investigation."

"*Number of Women Servants*, &c.—There is, in general, on dairy farms, one woman servant to every ten cows: these women are employed in winter in carding, spinning, and other housewifry business; but in milking, the women, both night and morning, during summer, where large daries are kept, are assisted by all the other servants, men and boys, except the man who drives the team."

SECT. II.—SHEEP.

The dairy being the object of greatest moment to the Cheshire farmer, less attention is paid to sheep in this than in most other counties. They are, however, to be found in large flocks on the hills bordering on Yorkshire and Derbyshire, and are of a good healthy kind, the wethers, at four years old, weighing from 15lbs. to 18lbs. the quarter; but the wool is coarse. Besides this, there does not appear to be any peculiar breed in the county, except that on the Forest of Delamere; which is small, the wethers weighing from 8lbs. to 12lbs. the quarter, at four years old. The mutton of this breed is much esteemed, and the wool is valuable, selling this year at 2*l.* 12*s.* 6*d.* per stone of 20lbs.; the fleeces, however, are small, often not weighing more than 2lbs. The wool is purchased by the Yorkshire manufacturers of cloth. In point of shape, these sheep are not much unlike a diminutive Norfolk, with faces and legs black, grey, brown, and white, generally with small horns.

A few farmers have Leicester flocks, and pay attention to their breed. There are also some South Down flocks in the hands of a few gentlemen; but the time, since their first introduction into the county, has been scarcely long enough to admit of any accurate appreciation of their value. Their wool is nearly of the same value as that of the Delamere forest sheep; their weight, at one and two years, is from 18lbs. to 25lbs. the quarter. The weight of a fleece from a South Down ewe is usually about 3lbs.; from a wether about 5lbs. Mr. Wilbraham, of Delamere Lodge, has in his flock a South Down ram, whose fleece this year weighed 8lbs. 10oz. within the weight of a penny-piece. A few gentlemen, and some respectable farmers have introduced the fashion of crossing with the Merino breed, and have purchased Merino rams for that purpose; but the result of these trials has not hitherto been sufficiently ascertained. A few straggling sheep of a mixed Leicester breed are to be met with on many farms; and some individuals are in the habit of purchasing Welsh ewes, by crossing which with a ram of larger size, the lambs are sold in summer, and the ewes in autumn to a good account.

I have heard several intelligent persons state it as their opinion, that a certain number of sheep might be kept on every dairy farm with considerable advantage to the farmer. This practice has indeed been adopted in some instances, and with much success. Several kinds of grass are relished by the sheep, which cattle will reject; of course a larger profit may be made from a pasture, in which a few sheep are intermixed with the cows; than there could be were the latter kept alone. The proper proportion of sheep to cattle on the same pasture would, of course, be varied by several local circumstances. The practice might be adopted with greater advantage on a sandy loam, than in any other situation; a stiff clay soil, such as is met with on very many of the dairy farms, being little favourable as a sheep pasture.

The number of sheep in Cheshire has certainly been increased within the last twenty years; but it seems improbable that the breeding of this animal will ever be carried to any great extent in the county. Almost all the farmers, with whom I have spoken on the subject, have given it as their opinion, that the profits derived from sheep in Cheshire, could never equal those arising from the dairy.

SECT. III.—HORSES.

"There does not appear to be any thing in the breed "of horses, here employed in husbandry, that is much "worthy of notice: they are of the strong, black kind, "generally about fifteen hands in height: those pur-"chased in Derbyshire are thought to be the best; al-"though the Leicestershire kind have, as is supposed, "improved the general breed of the country."*

No particular attention seems to have been paid to the breed of horses in Cheshire, though from the very great increase which has taken place, of late years, in the price of this highly useful animal, the improvement of the breed is considered as an object of more importance than formerly. The number of oxen employed in husbandry in the county is exceedingly small: a few gentlemen have tried them in their teams, but the example does not seem likely to be followed. Many arguments have been brought forward to prove that their use is preferable to that of horses, and that prejudice alone prevents the practice of employing them from being general. If the advantages were so very clear, it would seem extraordinary that in a county where the land is cultivated by so many enlightened and wealthy individuals as in Cheshire, judgment, as well as interest, should operate with so little power. Is it not fair to suppose that the arguments may at least be balanced; and that it would be wise to pause before any further call is made upon the legislature for its interference?

Those who have argued in favour of the superior weighing, when fattened, from ten to twenty score each. An easy method of preventing pigs from rooting is here practised by some gentlemen, and although a trifling circumstance, it may not be thought unworthy of notice. The gristly or horny part of the snout, through which the ring is usually put, is cut away with a sharp knife: by this means alone, without the least injury arising from it to the animal, the mischief is effectually prevented."*

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* Original Report.

Many of the Cheshire farmers breed their own stock of swine, a considerable proportion of which they dispose of at the fairs and markets in Lancashire. It is a frequent thing in this county for the labourer to keep a pig at his cottage, which he fattens, and kills at Christmas. I have heard the utility of this practice doubted, on the ground that the food which the cottager gives to his pig costs him more than is compensated for by the value of the animal. Where, however, the family is large, and there is a small piece of potatoe ground attached to the cottage, and more especially where a cow is kept, I should conceive that this would not be the case, but that the keeping of a pig must be productive of much advantage to the cottager; especially too if we consider, that any money which he may spend in providing for his pig, would, in all probability, have gone to the alehouse, had it not been thus employed.

The most complete pig styes I have seen in this county are those belonging to Mr. Bott, at Shewbridge, near Namptwich. This gentleman has lately purchased some very fine boars from Lord Anson.

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* Original Report.

SECT. V.—RABBITS.

THERE are but few rabbit warrens in this county: the principal are on Delamere forest: Sir J. F. Leicester has one in his park at Tabley. On several of the heaths and sand lands, rabbits are frequent, but not in number to constitute a warren.

Much doubt has been entertained as to the advantage of encouraging the breed of rabbits, and many farmers are so utterly averse to them, that they would wish the whole race to be entirely exterminated. Where land is enclosed, and applied to arable purposes, it seems agreed that by the injury they do to the fences, by interfering with the cultivation of the land, and by destroying its produce, they are much more detrimental than profitable. It is, however, a question for consideration, whether if a portion of weak sand, or dry heath land, was set apart for a rabbit warren; well fenced, and kept distinct for this purpose; it might not, in some situations, be more profitably employed in this, than in any other manner?

SECT. VI.—POULTRY.

POULTRY are numerous in almost every farm yard in this county, but I know of no peculiarity of breeds which can claim particular notice. The generality of farmers seem to be of opinion that it is more profitable to keep fowls for their eggs, than to breed them for the table; a considerable number however are brought into the different markets in the county for sale, and a still larger portion is purchased by the higglers, and carried to Manchester and the other markets in the south of Lancashire. Few turkies are kept at the farm houses, from the injury which they do to crops of every description. Great numbers of geese are bred by the cottagers, who rear and keep them on the commons and in lanes till midsummer, or later; and then generally sell them to the farmer, who feeds them in the stubble for market.

SECT. VII.—PIGEONS.

THE number of pigeons bred for sale in this county is very inconsiderable; it being the general opinion that they consume a greater quantity of produce than is compensated for by the profits they afford. They are generally kept at gentlemen's houses; few farmers having more than three or four couple; and many none. Where however an old hall or mansion house is occupied by the farmer, the number is frequently very considerable. Their dung is, I understand, particularly useful in the tan yards, in reducing the hides after they have been thickened by the action of the lime; and large quantities of it are purchased by the tanners, and applied to this purpose.

The value of pigeons in this county is about a shilling or sixteenpence a couple.

SECT. VIII.—BEES.

HIVES of bees are to be met with at many of the farm houses in this county, as well as at some of the cottages, and in the small gardens in the immediate neighbourhood of towns. It is probable that more attention paid in general to this industrious little insect would be productive of profit to the farmer or cottager; as the return made is of considerable value, and attended with little or no expense. In this county, however, the wetness of the climate is a circumstance which operates materially against their more general introduction.

The agricultural society of Manchester offers an annual premium to the cottager who shall raise the greatest number of hives.

CHAP. XIV.

RURAL ECONOMY.

SECT. I.—LABOUR.

THE wages of servants and labourers have been very considerably advanced within the last twenty years, in a proportion perhaps more than equal to the decreasing value of money. This is particularly the case in the neighbourhood of Macclesfield, Stockport, and the manufacturing parts of the county. Such high wages are occasionally obtained by children in these districts, that few are now brought up to husbandry; and it is there as difficult to get a boy to drive the plough, as a man to hold it. The average wages of servants residing in the house are probably nearly according to the following statement:—

	£.		£.	
Man to follow the team from	10	to	12	per annum.
Young man for the same employment, from 15 to 20, -	8	—	10	
Cow boy, or man, according to the stock - - - - -	8	—	12	

	£. £.
Servant for home work, hedging, thrashing, mowing, &c.	10 to 12 per annum.
Head dairy woman, according to the size of farm - - -	10 — 14
Other women servants - - -	4 — 6
Girls - - - - - -	2 — 4

The wages of labourers are from (in winter) 8*s*. to 10*s*. per week.

Ditto, ditto (in spring and summer) 9*s*. to 15*s*.

Where work is done by the piece or job:—

Reaping wheat is from 8*s*. to 9*s*. per acre.

Mowing oats and barley from 2*s*. 6*d*. to 3*s*. per acre.

Mowing grass or clover for hay, 3*s*. to 3*s*. 6*d*. per acre.

Digging ground for potatoes, 9*d*. to 1*s*. 6*d*. per rood of 64 yards.

In addition to the stipulated wages of the labourer, he has often several advantages from his employer, such as corn at a reduced price, or a piece of potatoe ground; each of which encrease the real, though not the nominal wages.

During harvest there is usually a certain allowance of ale, which is more or less according to the agreement made; and also a quantity of small beer, whey, or butter milk. Of late too it has been customary with many to add bread and cheese to the other expenses.

The hours of labour are, in the summer, from six in the morning till six at night, with a rest of an hour at noon. In winter, when the days are too short to admit of these hours, the time is undeterminate, the duration of day-light being usually made that of labour.

SECT.

SECT. II.—PROVISIONS.

The price of provisions is so continually varied by the operation of seasons more or less favourable, and by different external causes, that it is difficult to give any average statement on this subject. Generally speaking there has been a gradual increase of price, proportioned to the decreasing value of the circulating medium; and all kinds of animal food sell for, at least, one third more than they did ten years ago.

Beef and mutton average from 7*d.* to 8*d.* per lb.
Veal and pork from 6*d.* to 7*d.*
Rabbits, poultry, and eggs in proportion.
Butter from 1*s.* 2*d.* to 1*s.* 6*d.* per lb. avoirdupois.
Cheese from 2*l.* 15*s.* to 3*l.* 10*s.* per cwt. of 120lb.*
Wheat from 9*s.* to 12*s.* the bushel of 75lb.
Barley from 5*s.* 6*d.* to 7*s.* 6*d.* the bushel of 60lb.
Oats from 3*s.* 6*d.* to 4*s.* 6*d.* the bushel of 45lb.

The middle and lower class of farmers seldom, however, indulge themselves with much fresh animal food. At the close of the market they frequently purchase a little, at a cheaper rate, for the supply of a few days; the remainder of the week they content themselves with bacon or beef of their own curing; a little of which serves to give a relish to their large dish of potatoes or cabbages. Whey or buttermilk from the dairy contribute to complete their meal.

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* The constant average price of some dairies is much greater than the highest here stated; a circumstance which depends principally on the length of time the cheese is kept. By long keeping, cheese is considerably diminished in weight; so that the actual difference in price between that sold early, and that kept for one or two years, is not so much as at first view it might appear.

The cottagers and labourers have, in like manner, their messes of potatoes with bacon or butter; and where they can buy or beg a little whey or buttermilk from the farm, this supplies their drink. The farmer, however, is usually so fearful of robbing his calves or his pigs, that he seldom grants this indulgence, excepting to the cottagers in his immediate employ.

Bread made of wheat, or of barley and wheat mixed, is almost the only kind used in the houses of the more opulent farmers; and even the smaller farmers are much less in the habit of using bread made of barley alone, than they were a few years ago. Oat bread is seldom seen in Cheshire: oat meal made into cakes, or boiled with water or milk into hasty pudding, is a frequent article of diet.

Tea is in common use amongst the cottagers and labourers; and, with the usual additions, generally constitutes at least one of their daily meals. It is, I confess, by no means clear to me that this ought to be made the subject of that indiscriminate censure which I have so often heard pronounced upon it. It is objected to from its supposed tendency to debilitate and relax, and from its leading to great waste of time. With respect to the first point, it may admit of much doubt whether it does produce the evils imputed to it. Who, after excess of fatigue, has not experienced the enlivening and invigorating effects of this pleasant astringent beverage; and without feeling any subsequent debility?—It may not agree with every constitution, or it may be taken to an injurious excess; but if we are to bring arguments against it from the abuse of it, will not these be at least equally applicable to any substitute for it? Besides I would ask what substitute, so little expensive, can be found for the labourer? The produce of the dairy he is very generally debarred from; whilst the high tax upon malt renders even small beer scarcely accessible to him; and I will not suppose that those who regard tea as unwholesome and pernicious, would recommend the substitution of spirits for it. It is to be considered too that tea is made the vehicle of bread, butter, sugar and cream; all of which will be allowed to contribute importantly to nutriment. With regard to the time consumed by the cottager in tea drinking, it is not necessarily more than in taking any other meal; and if, by the little rest it affords him, he is better enabled to resume his labour, that time can hardly be considered as lost. The means of enjoyment in the possession of the poor are too scanty to admit of diminution.

SECT. III.—FUEL.

A FEW years ago, the fuel used by the farmers and cottagers consisted almost entirely of wood, and peat, or turf as it is here called, from the peat mosses. Each farm, where there was a peat moss in the township, had its moss room allotted to it, from which peat was procured. Though this is still used amongst the cottagers and small farmers, pit coal is now the general article of fuel in Cheshire. Macclesfield hundred is supplied in great measure from its own collieries; which also furnish a supply to the eastern part of Bucklow hundred.* The other districts of the county procure it either by the canals, which convey it into the interior from Staffordshire and Lancashire; or by land carriage immediately from the collieries in the hundred of Wirrall, Flintshire, and the two counties above mentioned. Cannel or *candle* coal, a fuel incomparably pleasanter than any other, is also in frequent use in the northern parts of the county: the best is brought from Haigh in the neighbourhood of Wigan; an inferior kind from Worsley in Lancashire, and from Staffordshire. The price of coal has been gradually increasing for many years, but apparently not more than in proportion to the increased price of labour: and the large demand for the use of the manufactories: on the banks of the canals it is 12*s*. 6*d*. or 13*s*. per ton.

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* See the Section *Minerals*.

CHAP. XV.

POLITICAL ECONOMY,

AS CONNECTED WITH OR AFFECTING AGRICULTURE.

SECT. I.—ROADS.

THOUGH the roads in Cheshire are, generally speaking, far from being good, they are greatly better than they were twenty years ago; and may certainly be considered at present as in a state of progressive improvement. Much more attention indeed is paid to them than was formerly; while the discovery of good gravel, in many places where before it was not known to exist, and the increased facility of obtaining other materials proper for their formation, have contributed greatly to the effect in question. From the general flatness of the county, its clayey surface, and the quantity of rain which falls in this district, Cheshire seems peculiarly to require some hard material for its roads. Pavements, which were formed of such boulder stones as could be procured from marl and gravel pits, were some time ago the most frequent in the county. As there was a difficulty in procuring an adequate supply of these stones; as the expense of forming roads with them was very considerable; and as these roads are always rough and unpleasant to travel on, gravel, either alone or mixed with broken boulder stones, has within these few years been substituted for them, on many of the roads which were formerly paved. Where the road thus constructed has had a dry foundation, and there has been no obstruction to the action of the sun and wind upon it, it has been tolerably durable. On wet and clayey bottoms, however, and especially where, as often happens, the adjoining hedge-row timber keeps the road in constant shade, gravel has not been found to succeed; and it has been necessary again to resort to pavements. These, however, instead of being, as formerly, nine or ten feet wide, are now laid, upon most of the turnpike roads, four or five yards in width; by which means the necessity is avoided of the wheels going constantly in the same track, and of course a much greater degree of durability is secured to the roads.

Stones for paving roads have lately been brought to Chester and Runcorn from the coasts of Flintshire, Denbighshire, and even of Anglesey; and conveyed by canals into the interior parts of the county. A siliceous grit from Mow-cop, a hill on the borders of Staffordshire, has been in many instances substituted for them; this material is also occasionally broken into small pieces, and used either instead of gravel, or mixed with it. It is firmer and harder than the gravel usually met with in Cheshire, and forms a much more durable road. In some parts of the county, limestone brought out of Derbyshire by the Peak forest canal, has been employed as a material for the roads; and in a few instances, where broken copper slag could be procured, this has been used as a covering. The roads formed in the latter mode are by far the best; and was the supply of copper slag more abundant, would, in all probability, become much more general.

What has been hitherto said, regards chiefly the turnpike roads; but it may with justice be observed, that notwithstanding many imperfections connected with the existing statutes respecting highways, a considerable proportion of the private roads in this county are so much improved, that where some years ago, and especially in winter, carriages could with difficulty pass, they can now proceed with comfort and dispatch. I must not here omit to mention a circumstance almost peculiar to the county of Cheshire, which is, that in every by-lane, where carts can scarcely force their way, a narrow paved cause-way is provided for the accommodation of horse and foot passengers, along which they may travel with expedition and safety at every season of the year. These causeways are usually defended by posts, or by a copse, from the injuries they might sustain in the passing of carts, &c.

"The present mode of committing the care of the roads to an officer *chosen annually and by rotation, without any regard to abilities*, &c. in each parish or township, seems to be one chief cause of the neglect and insufficiency of their repairs. Sometimes, though seldom, an active intelligent man is in that office; but no proper system of repairs being laid down and pursued, an ignorant or indolent officer succeeding the former, suffers what has been properly done to go to decay. The idea of not doing any thing till it is necessary, viz till the way is nearly impassable, is too prevalent; and there is little chance of roads left to the care of officers *so chosen*, ever being properly taken care of. The plan which has occurred to us as most likely to remedy the evil complained of, is to empower and direct the justices at their several quarter sessions, to appoint proper officers (removable at their discretion,) for districts of such a size as they shall find most adequate to the purpose, with suitable salaries, to be paid out of the county rates. These surveyors to have the sole management and direction of the roads which are put under their care; and to be accountable to the justices at their monthly meetings, in the several hundreds where such surveyors are appointed. The usual annual surveyors to be chosen and appointed as heretofore, and their only business to be, on proper notice from the district surveyor, to summon the persons liable to do duty on the highways; and to collect the assessments within their several parishes or townships. The justices to be empowered, on proper application, to make such rates as the nature and publicity of the road may require. Whether it would be proper that the counties at large, under particular modifications, should repair their several roads, by means of regular assessments in lieu of statute duty, may well deserve the consideration of the Board."*

SECT. II.—CANALS.

No circumstance evinces more clearly the prosperity of a nation, than the existence of an extended and flourishing system of internal intercourse. In our own island in particular, the facility of communication between different parts of the country, has borne a constant proportion to the great increase of manufactures and commerce, which has taken place within the last century; and the system of artificial navigation by canals and rivers is now probably carried to a greater extent in England, than in any other country on the globe, Holland, Flanders, and China only excepted. Few counties in the kingdom derive so many advantages from internal intercourse of this kind as Cheshire; and in few are the effects of it more generally important. The immediate proximity of the county to the flourishing towns of Manchester and Liverpool, has been highly favourable in this respect. The facility of communication with the latter town, afforded by the Weaver, has given to the salt manufactories in the interior of Cheshire, an extent and importance which renders the navigation on this river an object of interest not only to this particular district, but to the nation at large; while the numerous canals, intersecting the county, afford a cheap and easy conveyance of goods of every description to the most distant parts of the kingdom. The Weaver navigation, however, from its peculiar importance to the political economy of Cheshire, and from the principles of public utility upon which the undertaking has ever been conducted, merits a more particular description.

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* Original Report.

The river Weaver was in its natural state navigable by the high tides only about six miles above Frodsham Bridge. The demand for salt being considerably increased, and there being scarcely any conveyance for it but by land, one act of parliament was obtained in 1720, and another in 1759, to make this river navigable from Frodsham Bridge to Winsford Bridge. By the latter act, the management of the navigation was committed to the principal gentlemen of the county, as trustees; under whose superintendance most of the locks have been rebuilt; and (with the exception of one, which will soon be removed) these are now in excellent condition. In consequence, however, of the prodigious extension of the salt trade, the present accommodations on the Weaver navigation have been for some time found insufficient; and it is in contemplation to make an additional cut, of about four miles in length, from the weir near Frodsham Bridge, to a place called Weston Point. The execution of this plan will enable the flats to proceed to Liverpool in neap, as well as spring tides; and thereby to avoid the delay which they now experience at Frodsham Lock; below which, the river is so shallow and full of sand banks, that vessels are detained there, from four to six days, every neap tide, to the great detriment of the salt proprietors on the river, as well as of the merchants in Liverpool.

The river was made completely navigable from Winsford to Frodsham, and a considerable debt, thereby incurred, was discharged many years ago; since which time, the surplus arising from the tonnage has been regularly paid to the county treasurer; and disposed of by the magistrates, at each Michaelmas quarter sessions, according to the provisions of the two acts.

The length of the navigation from Winsford to Frodsham is about twenty miles, with a fall of forty-five feet ten inches divided between ten locks. The flats employed upon it carry from sixty to eighty tons, and some few one hundred. The total number is at this time two hundred and fifty. Rock salt, white salt, and coals, are the principal articles of carriage upon the navigation; all others being of an amount very inconsiderable.

Except in a few instances where the trustees have thought proper to reduce the tonnage, it is now, and can never exceed, one shilling per ton; a lower rate perhaps than is charged on any other navigation in the kingdom.

For an account of the quantities of rock and white salt carried down the Weaver navigation, see the section *Commerce*. An account of the coal brought up the river, is given under the section *Minerals*.

The Duke of Bridgewater's canal, the design of that wonderful self-taught genius James Brindley, though the greatest part of its course lies in Cheshire, is however more intimately connected with the neighbouring county of Lancaster; the original object of its formation having been to procure a more convenient water communication between Manchester and Liverpool, than was afforded by the artificial navigation of the Irwell and Mersey. It enters Cheshire near Stretford; and passing about half a mile to the north of Altringham, pursues a westerly course to Runcorn, where it is lowered precipitously into the Mersey, by a series of locks, fourteen in number, admirably constructed, and furnished with spacious reservoirs, to supply the waste of water occasioned by the continual passage of vessels. These are in fact the only locks on the canal, in a course of about thirty miles; so strictly has the principle of keeping the level been adhered to. Between Altringham, and the romantic village of Lymm, a stupendous mound has been constructed to carry the canal over the vale of the Bollin, a few miles above the place where this river empties itself into the Mersey. By means of this canal, Manchester is supplied from Liverpool with raw articles of foreign growth, cotton, dyewoods, &c. while in return large quantities of manufactured goods are sent to the latter place for exportation. Coals too are carried from the pits at Worsley in Lancashire, to various parts of the county, through which the canal passes; and large supplies of provisions are, by this means, conveyed to the Manchester markets, with little expense to the farmer, and with all the speed and regularity of land carriage. The vessels employed on this canal are of various sizes. Those which convey bulky goods, between Manchester and Liverpool, are usually from fifty to one hundred tons burthen; the coal is conveyed in long, narrow boats, several of them drawn by one horse. Boats resembling the Dutch treckschuyts, are used for the convenience of passengers, and pass daily between Manchester and Runcorn, producing a considerable revenue to the proprietor.

At Preston Brook, about five miles from Runcorn, the Duke of Bridgewater's canal is joined by the Grand Trunk, one of the greatest undertakings of this nature in the kingdom. By its means an internal communication is established between the Mersey, the Trent, the Thames, and the Severn, so that goods may be sent by water carriage from the interior of Lancashire and Cheshire, to Birmingham, Bristol, London, and Hull; while collateral canals or navigable rivers extend the intercourse to almost every place of importance in the kingdom. The Grand Trunk crosses Cheshire, in a direction from north west to south east, pursuing a course of about thirty miles in this county. At the distance of a mile from Preston Brook, it is carried under a hill, by a tunnel one thousand two hundred and forty-one yards in length, seventeen feet four inches in height, and thirteen feet six inches wide. At Saltersford, a few miles further, is another tunnel, three hundred and fifty yards in length, and of the same internal dimensions as the former. A third tunnel at Barnton, close to Saltersford, is five hundred and sixty yards in length. Few articles, the immediate produce of Cheshire, are at present conveyed along this canal. Though its course lies for many miles in the immediate neighbourhood of the salt manufactories and rock salt pits, it has hitherto been employed to a very trifling extent in the conveyance of these articles. A large quantity of coal is, however, brought along it from the Staffordshire collieries. The boats upon this canal are of about twenty-five tons burthen. The tonnage paid to the proprietors is three halfpence per mile.

The Ellesmere canal, forming a direct junction between the Mersey, the Dee, and the Severn, is another undertaking of much importance to the internal prosperity of the country. The act for it passed A. D. 1793. It leaves the Mersey, about eight miles above Liverpool, and crossing the peninsula of Wirrall to Chester, communicates with the navigable channel of the Dee. It then pursues its course by Wrexham, Ruabon, Chirk, and Ellesmere, to Shrewsbury. At Frankton common, in the neighbourhood of Ellesmere, a branch is sent off to Whitchurch, whence it has lately been extended to Namptwich; joining the Chester canal, near that town. The Ellesmere canal communicates with many extensive collieries, and with valuable quarries of slate and limestone: it has likewise a connexion with several iron works and lead mines in Shropshire and Denbighshire; and the facility of conveyance which it affords, will, in all probability, be the means of extending these sources of public wealth, and of disclosing others, hitherto unexplored.

Till its junction with the Whitchurch branch of the Ellesmere canal was completed, the canal between Chester and Namptwich proved a most burdensome concern to the proprietors, and was productive of no advantage to the internal intercourse of the country. The carriage on it was insufficient to pay for the necessary repairs; and shares were, in many instances, sold at one per cent of their original cost. The act for this canal, which was passed in 1772, provided for its extension to Middlewich; a part of the undertaking, which, had it been accomplished, would in all probability have ensured immediate success to the whole scheme; from the communication it would have opened with the Grand Trunk, and consequently with the large tract of country through which this canal passes. An absolute junction was indeed prevented by a spirit of injudicious monopoly in the proprietors of the Grand Trunk; the land carriage, however, necessary in consequence of this restriction, would have been too short to have retarded in any great degree the intercourse between the two canals. Another principal object of the extension of the Chester and Namptwich canal to Middlewich, was the carriage of salt from the latter place to Chester. It is not probable, however, that this project would have succeeded to any very great extent, even had the canal been completed, from the superior advantages for the exportation of this article which the port of Liverpool enjoys. It is, notwithstanding, much to be regretted that the undertaking was not executed to the extent at first proposed; a circumstance which originated chiefly, if not entirely, in the want of adequate funds. The expense of completing the canal from Chester to Namptwich was eighty thousand pounds; a sum far exceeding the calculation that had been made, The length of the part, thus completed, is eighteen miles ; its rise from Chester one hundred and seventy feet ten inches. Since the junction which has been effected with the Ellesmere canal, the carriage on it has increased very rapidly; and it seems highly probable that it will become, in a short time, an advantageous concern to the present proprietors. It is not unlikely that, in this case, the originally proposed extension of the canal to Middlewich will be carried into execution.

The Peak forest canal can scarcely be considered as having any very important relation to the political economy of Cheshire. It enters the county from Lancashire, crosses the north eastern horn, and, following the course of the Goyt for a few miles, passes into Derbyshire near the village of Whaley. The principal article conveyed on this canal is lime, which is met with in great abundance in the Peak. At Marple, near the junction of the Goyt and Etherow, the canal is carried over the united streams by an aqueduct of stupendous magnitude.

The benefits resulting to the agriculture of Cheshire, from its large participation in the system of internal navigation, are very considerable at present, and will, in all probability, become much more so. The cheap introduction of lime into the county, and the opportunity which is afforded of conveying marl at a slight expense to places where that valuable article is not met with, are both in themselves objects of great moment to the farmer. Another very important advantage is the cheap supply of fuel, afforded by these means, and the greater facility with which it is procured in every part of the county.

SECT. III.—FAIRS.

The town and village fairs held in this county are numerous, though many of them have of late years fallen very much into decay. At Chester there are three very considerable fairs in the year. The first, held on the last Thursday in February, is principally for cattle and horses; and is called *Horn and Hoof* fair. The others are held on July 5th and October 10th; and by the city charter are kept open fourteen days. The principal object of these two fairs is the sale of Irish linen, which is brought over in great quantities, and exposed to sale in a large and convenient building, erected and solely appropriated to this purpose. Besides private purchasers, numbers of shopkeepers from different parts of the kingdom lay in their stock of linen at these fairs. Very considerable quantities of Manchester and Yorkshire goods are likewise brought here, and sold in buildings conveniently fitted up for the purpose. At the October fair, there is a large sale of hops. On the whole it may be presumed that there are few fairs in the kingdom more considerable, or more generally frequented, than those held in Chester; though I understand that they are not so well attended now as formerly.

At Macclesfield there are five fairs in the year, for cattle, wool, cloth, cotton, and hardware goods. The most considerable is on June 22d. At Northwich also there are two considerable fairs in the year, almost entirely for the sale of Yorkshire goods.

The other fairs in the county are principally for the sale of cows, horses, pigs, cloth, linen, hardware and pedlary goods. None of them merit particular notice.

SECT. IV.—WEEKLY MARKETS.

The number of weekly markets in this county is fourteen: they are held on the following days.

Altringham on Tuesday.
Congleton on Saturday.
Chester on Wednesday and Saturday.
Frodsham on Wednesday.
Halton on Saturday.
Knutsford on Saturday.
Macclesfield on Monday.
Malpas on Monday.
Middlewich on Tuesday.
Namptwich on Saturday.
Northwich on Friday.
Sandbach on Thursday.
Stockport on Friday.
Tarporley on Thursday.

The principal articles for sale at these markets, are butcher's meat, poultry, butter, all kinds of vegetables and fruit. To several of them, cattle and pigs are brought every market day during several weeks in the spring. Namptwich in particular has a market for cattle, the first Saturday in February, called the *New Market*, equal to any of its fairs; and the sale of cattle continues here every Saturday till the latter end of May. Little corn or grain of any kind is now brought into the markets, being generally sold by samples to the dealers.* Bacon, oatmeal, flour, bread, and other articles of this kind, are usually purchased out of the retail shops; which scarcely a village, consisting of a dozen houses, is without.

Tolls are collected in many of the markets of this county, and are, of course, regarded with much dislike. Some few have, however, of late years been given up.

SECT. V.—COMMERCE.

In the subsequent section will be found a short account of the different manufactures in Cheshire; all of which constitute to a certain extent objects of commerce: they are each, however, of very trivial importance when compared with the great staple commodities of the county, cheese, and rock and white salt. For an account of the ~~manner of~~ making the cheese, the quantity made, and other circumstances relative to it, I must refer to the head of *Cattle*.

The greatest proportion of the cheese, especially of that made on the large dairy farms in the southern and middle parts of the county, is disposed of to the cheesemongers in London; who usually employ factors or agents, resident in these districts, to purchase the dairies for them; the farmers agreeing to deliver the cheese either at Chester, where it is shipped directly for London; or at Frodsham, from which place it is conveyed by way of Liverpool to the same market. Some is sent up the Staffordshire canal, to the inland counties; while no inconsiderable part of the smaller sized dairies, and a large proportion of the cheese made in the northern, and north east parts of the county, is purchased by the factors for the supply of the Stockport and Manchester markets; whence it is distributed through the populous districts in the south of Lancashire, and the west of Yorkshire.

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* The practice of selling corn by samples has been frequently complained of, and adduced as one cause of the existing high prices of that article. Such an opinion, however, seems to have no foundation in reality; and it is highly probable that the sale of corn in the market, would, of the two modes, have the greatest tendency to produce the effect for which the other is deprecated. Mr. Pitt, in his report of Staffordshire, has some judicious remarks on this subject.

Under the section of *Minerals*, I have given a detailed account of the natural history of the rock salt, and of the manufacture of white salt in this county. The commerce which these give rise to, and the number of hands for which they directly or indirectly find employ, render them objects of the first importance, in a commercial and political point of view. By a memorial of the manufacturers of white salt, proprietors of rock salt pits, and exporters of salt, presented, in 1805, to the late Mr. Pitt, against an export duty he had it in contemplation to lay upon rock and white salt exported to any part of Europe; it appears that the number of hands, employed in the various branches of the salt trade, amounted, at that time, to 2,950, exclusively of their families; and that the sum invested in salt works, rock pits, and lighters, amounted at a moderate valuation to 436,000*l.* over and above the capital employed to carry on the trade. The evils which would have resulted to the trade from the export duty which was intended to have been imposed, were so strongly pointed out in this memorial, that the minister was induced to abandon the tax he had proposed.

It has been mentioned under the section above referred to, that though rock salt has been found in several parts of the county, no pits are now worked, except in the neighbourhood of Northwich. Part of the inferior rock salt which is procured there, is used at some of the refineries in the neighbourhood: a further quantity is sent down the Weaver for the supply of the refineries at Frodsham, and of those in Lancashire, on the banks of the Mersey. The purer rock salt, or what is usually called Prussia rock, is carried by the same conveyance to Liverpool; whence it is exported chiefly to Ireland, and the ports in the Baltic. I find that the quantity of rock salt sent down the Weaver,

from April 5th,	1796,	to April 5th,	1797,	was	55,633	tons.
—	1797,	—	1798,	—	34,028	—
—	1798,	—	1799,	—	33,983	—
—	1799,	—	1800,	—	46,206	—
—	1800,	—	1801,	—	54,103	—
—	1801,	—	1802,	—	56,403	—
—	1802,	—	1803,	—	53,861	—
—	1803,	—	1804,	—	60,946	—
—	1804,	—	1805,	—	59,826	—
—	1805,	—	1806,	—	56,104	—

giving an annual average for the last ten years of 51,109 tons. In this, is included what is used at the Frodsham and Lancashire refineries, which may probably amount to about a third of the whole. By the report from the committee of the house of commons, appointed to enquire into the laws relating to the salt duties, ordered to be printed 30th of June 1801, it appears that

in 1798 were exported 20,168 tons of rock salt.
in 1799 ———————— 33,913 ————————
in 1800 ———————— 34,939 ————————

Of the above quantity,

in 1798 ———————— 16,095 tons.
in 1799 ———————— 22,374 ——
in 1800 ———————— 19,663 ——

were sent to different ports in Ireland: the remainder was exported principally to Denmark, Russia, Sweden, Prussia, and Germany; and a small quantity to Guernsey, Jersey, and the West Indies.

The white salt manufactured in Cheshire forms a still more important commercial object than the rock salt. While endeavouring to trace the rise and gradual progress of this manufacture in a former section, I stated that, a little more than a century ago, the quantity of salt made in Cheshire appeared scarcely more than adequate to its own supply, and that of a few adjoining counties. The rapid increase which, since that time, has taken place in this manufacture, exclusive of the active spirit of commerce and enterprize which has existed in the country, may be attributed to the formation of internal canals, which have furnished a more ready means of intercourse with the inland counties; and to the facility of communication with Liverpool, which the extension of the navigation on the Weaver, as high up as Winsford, where large salt works are erected, has been the means of effecting.

As a consequence of the opportunity, which is afforded by the Staffordshire canal, of conveying this necessary article into the interior of the country, the greater part of the salt manufactured at those works situated near this canal, is disposed of for home consumption. Some portion of what is made at Winsford and the neighbourhood of Northwich, is also thus applied; but by much the largest proportion of the salt manufactured at these latter places is exported.

It appears, from the accounts I have received, that from May 24, 1805, to May 24, 1806, there were disposed of for home consumption,

	Bushels.		Tons.	Bushels.
At Lawton - -	156,071	or	3,901	31
At Wheelock - -	181,297	—	4,532	17
At Roughwood - -	56,529	—	1,413	9
At Middlewich - -	97,292	—	2,432	12
At Winsford - -	32,004	—	800	4
At Northwich and its neighbourhood -	140,444	—	3,511	4
Giving a total of -	663,637 bu.	or	16,590 tons,	77 bus.

and paying a duty to government of 475,728*l.* 15*s.* This is exclusive of the salt manufactured at Namptwich and Frodsham; and of that made at the works on the Lancashire side of the Mersey, from the solution of the rock salt procured in the neighbourhood of Northwich; the greatest part of which is used for home consumption.

Though so large a quantity of salt is manufactured in Cheshire for home consumption, by far the largest proportion of what is made is sent down the Weaver to Liverpool, for exportation. Winsford, and the neighbourhood of Northwich, peculiarly enjoying the advantages of the navigation on this river, and having an abundance of brine, the salt exported has been in great degree furnished from the works established at these places. Whatever surplus there has been at the manufactories in other parts of the county, above the demand for home consumption, has also been similarly disposed of. I have received an account of the quantity of white salt, which has been conveyed down the Weaver, during the last ten years, nearly the whole of which has been exported. What is stated as from Northwich, includes not only the salt manufactured in the immediate neighbourhood of that place, but whatever has been sent down from the different works, situated near the banks of the Staffordshire canal; a communication by means of an inclined plane, betwixt this canal and the Weaver at Anderton, affording a greater facility of conveyance down to Liverpool, than was possessed before such a communication was established.

Account of white salt sent down the Weaver from Winsford and Northwich.

From April 5th, 1796, to April 5th, 1797.
Winsford, 24,335 tons. Northwich, 75,820 tons.

From April 5th, 1797, to April 5th, 1798.
Winsford, 30,222 tons. Northwich, 70,322 tons.

From April 5th, 1798, to April 5th, 1799.
Winsford, 38,611 tons. Northwich, 70,181 tons.

From April 5th, 1799, to April 5th, 1800.
Winsford, 38,423 tons. Northwich, 67,690 tons.

From April 5th, 1800, to April 5th, 1801.
Winsford, 52,881 tons. Northwich, 89,594 tons.

From April 5th, 1801, to April 5th, 1802.
Winsford, 61,586 tons. Northwich, 92,290 tons.

From April 5th, 1802, to April 5th, 1803.
Winsford, 47,825 tons. Northwich, 90,921 tons.

From April 5th, 1803, to April 5th, 1804.
Winsford, 3,820 tons. Northwich, 78,060 tons.

From April 5th, 1804, to April 5th, 1805.
Winsford, 48,207 tons. Northwich, 99,230 tons.

From April 5th, 1805, to April 5th, 1806.
Winsford, 63,552 tons. Northwich, 115,226 tons.

The annual average of the last ten years, according to this account of salt sent down the Weaver, is, from Winsford, 44,384 tons; and from Northwich, 84,933 tons; giving a total average of 139,317 tons.

The greater proportion of the salt sent down the Weaver, exclusive of that part of it which supplies the fisheries in Scotland and the home consumption, is exported to Ireland; to the ports in the Baltic; to the states of America; to Newfoundland; and the British continental colonies. A small quantity is sent to the West Indies; to Asia; and to Africa.

Though the manufacture of white salt, and the commerce to which it has given rise, have experienced so large an increase during the last twenty years, there seems reason to believe that they still admit of considerable extension. One of the obstacles to this is the state of the navigation of the Weaver, which does not furnish depth of water sufficient for the flats to convey the salt down during the neap tides; as a consequence of which, the merchant at Liverpool, rather than suffer the evils and expense arising from the detention of his vessel, either suffers it to sail with half a cargo, or seeks out some other article of loading. Should a more ready communication be formed betwixt the Weaver and the Mersey, by means of the projected canal from the former to Weston point, which would admit of the flats passing down at even the lowest tides, (see the article *Canals*) this inconvenience would be, in a great degree, removed.

Another circumstance which has operated as a check to the extension of the salt trade, has been the inequality of the duty betwixt foreign and British salt imported into Ireland. Whilst the former pays only 1*s.* 5*d.* per bushel, all British salt imported pays 2*s.*; the difference in the import duty being more than the original invoice cost of the British salt. What possible reason there can exist for such a preference being given to a foreign manufacture, it is difficult to conceive! We cannot, however, be surprized that the effect of it has been to lead the Irish to believe, that bay salt possesses a superior efficacy, in the curing of provisions, to salt of British manufacture; or that the quantity of the former imported into Ireland should be so considerable. By the report from the committee of the House of Commons appointed to enquire into the laws relating to the salt duties, we find that there were imported into Ireland

in 1799, 262,351 bushels of foreign salt.
1800, 225,040 ditto.
1801, 136,109 ditto.

Were the import duties upon foreign and British salt made equal, there can be little doubt but that the large sums, which are at present annually paid for bay salt, would be saved to the country; since, from the analysis which has been given of the British salt, made from natural brine springs, in the account of its manufacture (see the section *Minerals*), it appears to be at least equally free from the admixture of earthy salts, with the bay salt; and the size of the crystal can be readily varied by the manufacturer, so as to adapt it to whatever is its intended application.

Prejudices strongly imbibed are, however, difficult to be overcome. I received the following answer to some enquiries I made of a very intelligent gentleman at Cork, as to the comparative advantages of the bay, and large grained fishery salt of British manufacture, in the curing of provisions. "The large grained fishery salt is not used here; and I am doubtful whether any fair trial has been made of it. The St. Ubes salt comes cheaper, and perhaps is more solid in the crystal or grain; and unless the import duty on British salt was lowered, I expect it would be very difficult to lead the provision merchants to use it in preference to the Portugal salt. They know that the latter answers their purpose; and nothing but a material difference in cost, would be likely to alter their opinion, or prejudice. I have myself no doubt of the large grained fishery salt curing provisions quite as well as the St. Ubes salt."

The same prejudice has existed in Scotland. The Rev. Dr. Walker, the late very ingenious professor of natural history in the university of Edinburgh, in an essay on the history of the herring, published in the second volume of the Prize Essays of the Highland Society, page 297, gives it as his opinion that "the foreign salt, or bay salt, is the best used in Britain for the preservation of fish; and, when duty free, may be received for the purpose at a moderate price. The broad grained salt of Liverpool is next to it in quality; but the small grained salt of that place, and the Irish salt, though likewise formed from the rock salt of Cheshire, are much inferior; and our small Scots salt, made entirely from sea water, and with culinary heat, is still inferior to these. In the bay salt, which is formed merely by the heat of the sun, its two essential ingredients, the muriatic acid and the fixt fossil alkali, are so equally combined as to form a perfect salt, with little addition of any other extraneous saline matter. Our Scots salt, on the contrary, is loaded with superfluous alkali, and with the bitter earthy salts, called vitriolated and muriated magnesia. In consequence of this difference, the bay salt is sharp and sweet to the taste; while the Scots salt is, comparatively, alkaline and bitter. By these properties, the bay salt is a much more powerful antiseptic, and far better adapted than any other of the above salts for the preservation of fish, especially in a warm climate." I believe I may venture to say that had the Doctor taken the trouble to analyze the different specimens of salt of Cheshire manufacture, he would have found that even the small grained was almost entirely free from any earthy salts; that the "muriatic acid, and the fixt fossil alkali *were* equally combined," and that any difference in the effects of the different salts, was owing solely to the variation in the size and compactness of the crystals. There does not therefore appear the most distant reason to suppose that the salt manufactured from natural brine springs, such as is that of Cheshire, should be in any respect inferior, for whatever purposes it is designed, to the salt produced from sea water. This seems to be a subject highly deserving the attention of the legislature.

SECT. VI.—MANUFACTURES.

Little remains to be said on this subject after the detailed description of the salt manufacture which has been given under the section on *Minerals*. This indeed is the only manufacture, for which Cheshire is peculiarly distinguished, unless the making of cheese can with propriety be so termed. From its immediate neighbourhood to Manchester, it has of course participated in the great extension of the cotton manufacture which has taken place in that town, and the surrounding country; and there are few situations in the county, favourable to the erection of cotton mills, where such edifices are not now to be met with. This is particularly the case in the part more immediately adjoining to Lancashire; and it has invariably been accompanied by a proportionate increase in the population and wealth of the country. From its vicinity to Manchester, and its large participation in the trade of that place, Stockport has now become one of the most flourishing towns in the kingdom; having acquired a degree of consequence and population, which render it an object of great importance in the political economy of the county. A serious check has indeed been lately given to the prosperity of the cotton manufacture, by the unfortunate aspect of our foreign connections, and the consequent uncertainty of all commercial speculation; but this, it may be hoped, is an evil of a temporary nature, which will yield to the influence of better times, and a more happy system of continental policy.

At Macclesfield and Congleton there are large silk mills, and handkerchief weaving is carried on to a considerable extent. At Namptwich, the cotton mills belonging to Mr. Bott, employ several hundred hands: here too, and at Sandbach, large quantities of shoes are manufactured, and sent to Chester for exportation. On the borders of Yorkshire, at the north-eastern extremity of the county, some woollen cloth is made. In the city of Chester are very considerable works for the making of shot, as well as for the manufactory of white and red lead. At Thelwall, on the banks of the Mersey, three miles above Warrington, there is a large manufactory of gunpowder. Tanning is carried on to a very great extent throughout the whole of Cheshire, and more particularly in the middle and northern parts of the county. This circumstance may, in all probability, be attributed to the large proportion of oak timber which it contains, and to the plentiful supply of hides from Lancashire, as well as of Irish and American hides imported into Liverpool. The great diminution of oaks in the county, and the excessive rise in the price of oak bark, in consequence of this and other circumstances, have however rendered the discovery of some adequate substitute, an object of the greatest importance, not merely to the tanner, but to the country at large.* Various experiments have accordingly been made on the subject, and with various results, though none of them so decidedly favourable as might have been wished. Mr. Whitelegg, an ingenious tanner at Ashley, near Knutsford, made some experiments a few years ago with the twigs and ends of the boughs of oak, as a substitute for the bark. These, ground down, and used in the same way as the bark, manifested strongly astringent properties; but the necessity there was found to be for their immediate application, took away very greatly from their value; and their use is now, I believe, almost entirely discontinued, though the plan at that time was adopted by several other tanners. Next to the bark of the oak, that of the Spanish chesnut *(fagus castanea)* has been found most efficient for the purposes of tanning; but from the scarcity of the tree, it can be used only to a very small extent. The barks of the crack willow *(salix fragilis)*, and of the white willow *(salix alba)*, both possess astringent properties, and have been used with some success in medicine, as substitutes for the Peruvian bark. They have also been recommended as likely to be of considerable use in the tan yards, and it seems not improbable that this may be the case, though I have not heard the result of any trials that have been made with them.* Next to these, the bark of the white poplar *(populus alba)*, and of the elm *(ulmus campestris)*, have been found the best suited to the purposes of tanning. The former may now be had at *4l.* per ton; but ~~were its use to be~~come more general, this price would no doubt experience a very great increase. None of these barks can, however, be compared in point of efficiency with that of the oak, and it cannot but be regretted that an article so valuable and important as this, should every day be diminishing in our own country. Considerable quantities have lately, indeed, been imported from America, but the supply still continues inadequate to the demand for the article.†

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* Twenty years ago oak-bark was sold at 3*l.* or 4*l.* per ton. The same quantity cannot now be had under 12*l.* or 14*l.*

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* I have since heard that willow bark has been used with success by several tanners, in the tanning of sheep skins, and light goods; it sells at *5l.* per ton.

† It may be proper to mention here that Mr. Hatchett has lately discovered

The operation of the manufactures in advancing the price of labour in this county, has already been noticed under that section. The question whether they are in general favourable to the interests of agriculture, is one which admits of much discussion. Though at the risk of advancing an opinion, which may perhaps stand in opposition to the general sentiment on the subject, I feel myself inclined to answer in the affirmative. The increase of wealth and population, which is the never failing result of a flourishing manufacture, by the additional demand which it creates for the products of the earth, communicates a powerful stimulus to agricultural industry. New implements, new manures, new modes of agriculture are discovered and beneficially employed; the ground, that was before partially cultivated, is brought to its highest point of productive vigour; and districts, which once presented to the eye nothing but a dreary waste, are enclosed and converted to a state of profitable cultivation. With respect to the

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covered an artificial substance resembling tannin in all its most essential properties; an account of which is given by this ingenious philosopher in the Philosophical Transactions for 1805. This artificial substance may be obtained in three different ways; by digestion of the nitric acid on any carbonaceous substance, animal, vegetable or mineral; by distilling the same acid from indigo, resins, and various other substances; or by treating resin, camphor, &c. with alcohol, after digestion with the sulphuric acid. The first of these methods produces the substance most easily, and in the greatest abundance; 116 grains of it being procured from 100 of vegetable charcoal. From some additional experiments of Mr. Hatchett, it would appear that this artificial substance is composed of oxygen, hydrogen, and azote, with a base of carbon. Should this investigation be further pursued, and any consequent practical use established, the discovery would be attended with the most important advantages both to those immediately interested, and to the country at large.

the effect that has been produced by manufactures on the morals of the lower classes of society, nothing very favourable can, I fear, be said. Were more attention, however, paid to this subject, by the proprietors of individual manufacturing establishments, it appears to me that much might be done towards correcting an evil at present so alarming in its nature, and productive of so many prejudicial consequences to the community.

SECT. VII.—POOR.

THE condition of the lower classes of the community must in every state constitute, to a certain degree, an object of legislative attention; and perhaps in few branches of domestic policy, is the existence of wise and judicious regulations more essentially necessary to the welfare of a country. Under the Section on Poor Rates I have made some remarks on the present system of poor laws, with the design of shewing that its operation is completely inadequate to the ends in view; too frequently subverting, rather than promoting, the real comforts of the lower classes of society. The preservation of a spirit of independence among the poor, is a point of more importance than may generally be supposed. When a man has once received relief from the overseer, his inclination to recur to the same source for subsistence is increased; the most powerful stimulus to personal exertion is taken away; and, with his industry, he too frequently loses his moral character, and those habits of temperance and sobriety, which are so essential to real happiness. These circumstances clearly point out the propriety of making the poor depend,

pend, as much as possible, upon themselves; and perhaps the accomplishment of such a measure, to a certain extent at least, would not be attended with so much difficulty as might, in the first instance, be supposed. Were sufficient encouragement given to the more general institution of box clubs and societies among the lower classes of the community, they might, under proper regulations, be made the means of diminishing, very considerably, the present amount of poor's rates; while a more effectual relief would in fact be afforded to the poor, than can possibly be done by the measures involved in the existing system of poor laws. I am happy in being able to state that many of these societies have been established in different parts of Cheshire; and that they have, in general, been productive of much benefit to that class, whose interests it is the view of the institutions to promote. A few societies of the same kind have been established for the relief of females.

Upon the whole, the condition of the poor in this county may be regarded as equally favourable, in point of general comfort, with that prevailing through most other parts of the kingdom. A circumstance which tends materially to keep up the amount of the poor rates here, as well as in other counties, is the want of knowledge, and the inattention too frequently met with among the overseers of the different townships. It is by no means an uncommon case for a man, when he first enters on this office, to be completely ignorant of the actual state of the poor in his township; he distributes money, without knowing the rights of the claimants, or the proportion of assistance to which they are entitled; and by the time he has acquired this information, he quits his office. Attempts have been made, in some instances, to remedy this evil. In one of the townships in Macclesfield hundred, a plan has been adopted to ascertain the real state of all those who claim relief from the overseers, by annually drawing up a register of various circumstances connected with their situation; on a reference to which, the overseers may be enabled, in every instance, to ascertain what are the real necessities of the claimants, and to proportion their distributions accordingly. Some idea of the nature of this register may be procured from the annexed paper. The pursuance of the plan has had the effect of diminishing greatly the amount of the poor-rates, in the particular township alluded to.

Former Residence.	Present Residence.	Father.	How em-employed.	Wages he earned per week.	Mother.	How employed.	Wages she earns per week.	How many children.	Their different ages.	How many actually employed.	How many capable of being employed.	Earnings of the whole family per week.	What relief they receive per week.	What occasional relief within the last year.	Character of the family.	Rents paid	Remarks.
				s.			*s. d.*					*l. s. d.*	*s. d.*	*l. s. d.*		*l. s. d.*	
Radcliff -	Sunderland.	B. C.	Dye house.	14	B. C.	Chair woman.	3 0	3	5, 8, 10.	1	1	0 19 0	2 0	2 0 6	Good.	1 11 6	House rent withdrawn.
Styall - -	Stockport.	Dead.	—	—	A. B.	Sundries.	3 0	4	All girls. 7, 10, 12, 16.	1	2	0 7 6	3 0	—	Ditto.	2 2 0	
Ditto - -	Ditto. - -	C. D.	Weaving.	14	C. D.	Nurse.	4 6	3	Girl. 3, 6, 9.	—	—	0 18 6	2 0	1 18 7½	Ditto.	2 0 0	
Wilmslow	Bollington.	Dead.	—	—	D. E.	Reeler.	6 0	5	Girls. 9, 12, 14, 16, 21.	5	5	1 9 6	2 0	0 14 6	Indifferent.	2 15 0	This family earns 1*l.* 9*s.* 6*d.* per week. Have notice they are to receive no more aid from the township.
Ditto -	Chorlton.	F. G.	Blind and incapable of working.	—	E. G.	—	—	—	— —	—	—	—	2 6	3 0 2	Good.	0 14 0	Had sickness.

SECT. VIII.—POPULATION.

THE population of Cheshire has been increasing with considerable rapidity for the last fifty years; a circumstance which may be attributed to the operation of several causes, but principally perhaps to its participation in the flourishing state of the Lancashire manufactures. The increase which has taken place in the salt trade, of late years, has likewise been a means of augmenting very considerably the population of the district in which the salt manufactories are situated; while, from the necessary and intimate connection subsisting between the manufactures, and agriculture of a country, a proportional increase has taken place in the number of those engaged in husbandry and country employments. The following statement, procured from the Abstract of the Returns on the Population Act, passed in the 41st year of the present reign, will give a tolerably accurate idea of the population of this county, and of the proportion ascertained to exist between those employed in agriculture, and the other occupations of life.

DIVISIONS.		HOUSES.			PERSONS.		OCCUPATIONS.			TOTAL of PERSONS.
		Inhabited.	By how many families occupied.	Uninhabited.	Males.	Females.	Persons chiefly employed in Agriculture	Persons chiefly employed in Trade, Manufactures or Handicraft.	All other Persons not comprized in the two preceding Classes.	
Hundred of	Broxton - -	5,467	6,017	136	12,813	15,303	4,905	3,058	17,802	28,116
	Bucklow - -	4,958	5,611	84	14,178	14,590	8,570	4,782	15,316	28,768
	Eddisbury - -	2,896	3,317	61	8,837	9,014	4,137	1,357	5,826	17,851
	Macclesfield -	11,493	12,291	580	31,685	33,495	7,217	51,278	16,587	65,180
	Namptwich -	3,218	3,547	122	8,653	8,984	6,038	2,303	9,886	17,637
	Northwich -	4,425	4,727	94	11,454	12,001	4,286	3,728	13,204	23,455
	Wirral - - -	2,025	2,103	62	5,139	5,605	5,870	941	4,910	10,744
Totals		34,482	37,613	1,139	92,759	98,992	38,823	67,447	83,031	191,751

In this statement the city of Chester is included under Broxton hundred; and the different towns in the county under the respective hundreds in which they are situated. The following is a statement of the population, &c. of the towns taken individually.

Towns.		Houses.			Persons.		Total of Persons.
		Inhabited.	By how many families occupied.	Uninhabited.	Males.	Females.	
City of	Chester - -	3,109	3,427	85	6,492	8,560	15,052
Town of	Macclesfield	1,426	1,509	101	3,979	4,764	8,743
	Stockport -	2,573	2,965	126	6,983	7,847	14,830
	Congleton -	828	862	27	1,713	2,148	3,861
Parish of	Sandbach -	379	390	5	906	938	1,844
Town of	Middlewich	261	267	7	621	569	1,190
	Namptwich	758	788	66	1,612	1,851	3,463
	Northwich	340	340	6	632	706	1,338
	Knutsford	478	543	13	1,051	1,321	2,372
	Altringham	340	346	3	809	883	1,692
Parish and Lordship of	Frodsham	272	889	—	740	811	1,551
Town of	Tarporley	138	138	—	309	365	674
	Malpas - -	191	205	3	437	469	906
	Totals -	11,092	12,164	441	26,284	31,232	57,516

A reference to the results afforded by the former of these statements, will make it appear that about one-fifth part of the whole population of the county, is immediately connected with agriculture. Precise accuracy in an estimate of this nature cannot be expected, but it is very probable that the one here given may not deviate in any considerable degree from the truth.

CHAP.

CHAP. XVI.

OBSTACLES TO IMPROVEMENT.

THAT the operation of tithes is unfavourable to agricultural improvement in general, must be allowed by every one, who is not wholly blinded by prejudice or self-interest; and this may undoubtedly be stated as one of the principal obstacles opposed to its progress in this county. The question respecting the practicability of some adjustment, which would remove the evil, and at the same time satisfy both the parties concerned, is one of much importance to the interests of the country; but its discussion involves a length of detail and argument, which would be neither necessary nor proper in a report of this kind.*

The evil arising from the tax upon bricks, which, by preventing the pursuance of a proper system of draining, has hitherto constituted a material obstacle to improvements in agriculture, is in a considerable degree removed by an act passed in the present year (1806), which exempts from the operation of the tax a particular description of tiles, to be employed for the purposes of draining. These tiles the act directs to be made of a semi-elliptical form; the width, measured on the inside, not exceeding six inches in any part; and the height, from the outside of the crown of the arch in a perpendicular line to the extreme edge, exceeding in all cases the width thus measured. A foot, or projection from the bottom of the arch, not exceeding two inches in breadth, is allowed for the purpose of keeping up the tiles in loose or friable soils. Though considerable advantage, however, may be derived from the use of tiles of this description in draining, it does not appear probable that the operation of this act will obviate entirely the impediment, arising from the tax on bricks, to this mode of improving the land. The general shortness of leases in Cheshire may perhaps be stated as another obstacle to improvements in agriculture. That inconveniences are very frequently connected with leases of long duration, cannot be doubted; but is there not some reason to believe that a term of seven years, which has of late been much more frequent in this county than formerly, is too short for the encouragement of a spirit of improvement among practical agriculturists? Few individuals will hazard expensive experiments, the success of which must depend upon a variety of circumstances, without an interest of sufficient permanency previously secured in the land on which these attempts are made.

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* The plan of a commutation of tithes, suggested by Mr. Pryce, in the fourth volume of the Bath papers, appears to be much approved; and we have, from various quarters, been urged to recommend Mr. Pryce's Essay to the most serious consideration of the Board.—*Original Report.*

Until the utility of salt as a manure be more decidedly ascertained, it must remain doubtful whether the duties on this article should be regarded as a drawback on agricultural improvement, or not. Certainly, the operation of these duties is prejudicial by precluding, in a great measure, the possibility of experiments, which might otherwise be made with a view of deciding the point in question.

In the present state of the country, however, we cannot expect that the duties on salt, so far as regards its domestic consumption, should be removed: but is it not possible that some means might be devised of rendering it applicable to agricultural purposes without risk of injury to the revenue? Even if this could not be done with respect to the clean salt, there seems no reason to object to such an application of the foul and refuse article, large quantities of which are now thrown into the river. Why may not this be so intimately mixed, under the inspection of an excise officer, with the ashes of the coal used in the manufacture, that it should be rendered inapplicable to any domestic uses, till it had been re-dissolved, and the water of solution evaporated? Any person evaporating this, without due notice to an officer of excise, would be subjected to the same penalties, as for procuring salt from any other brine, without a similar notice.

The obstacles to improvement which originate in the character, and habits of the farmers themselves, are now gradually wearing away in this county, as well as throughout the whole of the kingdom. Too many mistaken prejudices still continue amongst the small farmers; but with those of a higher class an enlightened spirit of improvement is excited, which cannot fail of conducting to the most beneficial results.

CHAP. XVII.

MISCELLANEOUS OBSERVATIONS.

SECT. I.—AGRICULTURAL SOCIETIES.

THE society which has the most intimate connection with the agriculture of this county, is that which was established at Manchester, in the year 1767. The views of this institution were at first confined to the hundred of Salford, the division of Lancashire in which Manchester is situated; but were subsequently extended to a district of thirty miles round that town, comprizing the whole of the northern and middle parts of Cheshire. Among the members of this society are gentlemen of the first respectability, as well as many wealthy yeomen, and farmers: the Earl of Stamford has for many years been the president. They have two meetings in the year, the one at Manchester, the other at Altringham, at which several premiums, having in view the promotion of desirable objects in agriculture, are proposed; and a short report is annually published, giving a list of the persons to whom the premiums of the last year were adjudged, and stating those which are offered for competition the ensuing year.

The societies at Newcastle under Line in Staffordshire, and at Drayton in Shropshire, have likewise an intimate connection with the agriculture of Cheshire, and particularly with that of the southern parts of the county.

I have heard doubts stated by several intelligent persons, to whom I have spoken on the subject, respecting the utility of these institutions, considered with a reference to the interests of agriculture.* That they might,

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* "It is to be regretted that the general value of the objects proposed for competition by agricultural societies is such as to prevent the greater number of farmers from attempting the acquisition of a prize. It cannot be expected that the holder of sixty acres, however great may be his attention and skill, should contend in the quantities of his produce with the occupier of two or three hundred; neither can the holder of land, the annual value of which is under 20*s.* per acre, contend in either quantity or quality, with the farmer whose land is worth three times that sum. Consequently by much the greater number of prizes must fall either to the occupiers of good land, to those in possession of great farms, or to men of fortune who, regardless of expense, pay every attention to the object in question, whether attended with profit or not.

"These societies most assuredly excite emulation, and as a spur to experiment are beneficial; but should not more attention be paid by them to difference of soils, size of farms, and real profits? When a prize, for instance, is proposed for the best crop of turnips on a certain quantity of ground, should not the value of the land, and every other incidental expense, be taken into the account; and the clear value of the crop, after the deduction of these expenses, be made the ground of competition? The adoption of this practice to a greater extent would in all probability render the agricultural societies of this county much more generally beneficial than they are at present."—*Mr. Fenna.*

"Premiums as an encouragement to particular modes of husbandry, or improvements in any country where the prevailing system of practice is different to that proposed, have little or no effect with common practical farmers. The judicious cultivator, however, wants no pecuniary reward to stimulate his industry, and spur him on to rational improvements; nothing more is wanted than to convince him that the thing might, generally speaking, be rendered more efficient than they are at present, may be admitted; but, at the same time, I must confess, I see no grounds for doubting that they are upon the whole beneficial to the country. Nothing is more conducive to general improvement than a rational spirit of investigation and experiment. This spirit the institution of agricultural societies has had a direct tendency to excite and diffuse; while it has been of the most eminent service in directing the attentions and exertions of practical agriculturists to those modes of cultivation, which are the most likely to be beneficial to themselves, and to the nation at large.

SECT. II.—WEIGHTS AND MEASURES.

THE great variety in the weights and measures, employed in different parts of the kingdom, is productive of so much general inconvenience, that it is earnestly to be wished some means could be devised by the legislature for effecting an exact uniformity in this respect. Though this variety is very considerable in Cheshire, yet, upon the whole, the weights and measures used in this county, are more convenient than those employed in

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thing proposed is attainable in *common practice*, and that it is more eligible, and advantageous than what he has been accustomed to If that can be done, the improvement, whatever it may be, carries with it in itself a more substantial reward, than can be conveyed by any other common means. Without such a conviction, any attempts to encourage improvements through the help of premiums will probably be found expensive, and in the end fruitless."—*Original Report.*

in many other parts of the kingdom. There is still however great scope for reform.

The weights in Cheshire are usually the avoirdupois 112lb. to the hundred weight. Some articles are sold by what is called the long hundred of 120lbs. Cheese is one of these. Hay too is generally sold by the cwt. of 120lbs.

Butter, in most parts of the county, is sold by the pound weighing eighteen ounces. In some places it is sold in lumps, made up in moulds of different forms, called dishes, or half dishes. These weigh twenty-four, or twelve ounces each.

Potatoes are usually sold by the bushel weighing ninety pounds.

Wheat by the bushel weighing either seventy or seventy-five pounds.

Oats by the bushel weighing from forty-five to fifty pounds, according to price and bargain.

Oatmeal by the load weighing two hundred and forty pounds.

Barley is sometimes sold by the bushel of sixty pounds, sometimes by the measure of thirty-eight quarts.

Malt is sold by the measure of thirty-two or thirty-six quarts.

Butcher's meat is sold by the pound of sixteen ounces.

Land was formerly very generally measured in this county by what is called the Cheshire acre, containing 10,240 square yards; and this measure still continues to be employed to a certain extent, particularly in the northern part of the county. The statute acre, of 4,840 square yards, is now, however, in much more general use; and this accordingly is the measure to which I have invariably referred in the course of the Report.

A rood of land is sixty-four yards.

A rood of hedging, ditching, &c. is eight yards in length.

A rood of marl is sixty-four cubic yards.

SECT. III.—SUPPLY OF LONDON.

FROM the relative situation of this county, it cannot be expected to contribute, in any great degree, to the supply of the metropolis. Indeed, cheese is almost the only article of agricultural produce, with which Cheshire furnishes the London markets. This, as was mentioned under the article *Commerce*, is purchased by the cheese factors, and sent generally either to Chester and Liverpool, where it is shipped for London, in vessels regularly employed in the trade.

Considerable numbers of young cattle, which have been drifted from the dairy stocks in this county, are slaughtered in London, after having been previously fattened in some of the feeding counties.

SECT. IV.—EXPERIMENTAL FARMS.

THAT much advantage may be derived to the general interests of agriculture from experimental farms conducted with spirit and judgment, can scarcely be doubted. I know, however, of no undertaking of this kind, at present in existence in Cheshire. Some years ago, an experimental farm was established at Waverham, near Northwich, by a few intelligent gentlemen and farmers in that neighbourhood, in which a good deal of draining was done, several of the improvements in modern husbandry practised, and new breeds of cattle and sheep introduced; but it being found upon the whole an expensive and losing concern, from the nature of the land and other circumstances, the attempt was abandoned, and has not since been resumed. It may be remarked, however, that where land is retained by the proprietor himself, (a circumstance of frequent occurrence, and to considerable extent, in Cheshire) this may be regarded in some measure as an experimental farm; on which, from the existence of an adequate capital, every new improvement is introduced, and experiments made, which would have been beyond the reach of the ordinary farmer.

CONCLUSION.

MEANS OF IMPROVEMENT.

FROM what has been said in the foregoing pages, it will have appeared that the prosperity of the county of Chester has been, of late, rapidly progressive. Trade flourishes, and agriculture is improving. With an increase of population, industry has increased, and discovered new means of obtaining wealth: waste lands are annually inclosed; and new and substantial buildings are erected in various parts of the county. Much, however, yet remains to be done; and I have endeavoured to point out some means by which the cultivation of the land may be carried to a greater degree of perfection. Amongt these the most important have been the introduction of green crops, alternately with corn, into the course of tillage, and the irrigation of meadows; practices which have already been adopted to a certain extent, and which will, in all probability, become much more frequent. Their consequences are indeed so eminently beneficial, and especially to the dairy farmer, that it is surprising attention to individual interests has not sooner led to their more general introduction.

Another subject to which I have endeavoured to call the attention of the gentlemen and land-owners, for the improvement of the country, has been the advantage to be derived from the increase of plantations on the wastes, and in all situations in which the growth of trees might be encouraged, without injury to agriculture. The decrease of timber is a most serious evil, which hereafter will be severely felt, unless new supplies are provided for posterity by the spirited exertions of the present generation.

But the most important object offered to the consideration of the public, has been the operation of the present system of poor laws; a system to which may be attributed, in a great measure, the increasing corruption of morals among the lower ranks of society, especially in those districts where manufacturing establishments are the most numerous and extensive. I have been too mistrustful of my own experience and knowledge of the complicated interests of society to suggest the means by which the evils complained of may be remedied. The most intelligent men confess that the subject is one of the greatest difficulty; but "the wise and active conquer difficulties by daring to oppose them," and every well-wisher to his country must earnestly hope that by the influence and interposition of some vigorous and enlightened minds, a revision of our whole political economy, as it affects the poor, will soon take place; and that such amendments and alterations will be made as may secure an increase of comfort to the really distressed, prevent the idle and profligate from living, as they now do, on the means of the laborious, and rescue the young and unprotected from depravity. The prosperity of no community, however dazzling, can be solid, which has not for its basis the industry, the happiness and the morals of the people at large. It may be compared to the palace of ice described by Cowper,

——— a scene
Of evanescent glory————
As transient in its nature, as in show
'Twas durable. As worthless as it seemed
Intrinsically precious. To the foot
Treach'rous and false, it smiled and it was cold.

Cowper's Task, Book V.

APPENDIX.

APPENDIX.

ON THE NATURE AND ORIGIN OF MARL.

BY

J. T. STANLEY, ESQ. F. R. & A. S. &c.

MARL is a substance found in many parts of England, but in peculiar abundance in Cheshire, where it has been long used with great advantage for the improvement of the soil. It consists of clay, sand, and lime very intimately, but unequally mixed; and has the appearance of a clay of a dark brown colour, intersected with light blue veins; though, when freshly broken, it has rather a granular surface: on pressing it between the fingers, however, it has a softer feel than clay. It is seldom found as a stratum, or layer of any length; but generally a few feet below the surface, in detached masses of twenty or thirty roods in extent, and eight or ten yards in depth; covered with clay, and resting on a bed of sand or gravel. It has been spread over land in Cheshire for many centuries; and leases granted in the reigns of Edward I. and II. contain clauses obliging the tenants to make use of it.

That marl is most esteemed which contains the most lime; but good effects are produced by such as contains scarcely a sufficient proportion to be perceptible. The farmers say, it strengthens the soil, enables the growing crops to maintain their vegetation during a dry season, and that it fills the kernels of corn. It does most good on light land; but even stiff lands derive a benefit from it. A field is said to be well marled when 128 solid yards are spread over a statute acre. Marl falls into pieces, after having been exposed for a few months to the weather, and is then ploughed in. Its greatest effect is apparent when the field is brought into a second course of tillage; and after six or eight crops have been procured from it, it ceases to operate.

A doubt has arisen whether marl acts mechanically, or as a manure affording food for the growth of plants: whichever may be the case, we must suppose that it has a certain peculiar action of its own, independently of the earths chiefly composing it; for clay, lime, and sand, thrown promiscuously over a field, would not produce the same effects; otherwise, farmers would employ those substances separately instead of marl, whenever they could procure them at less expense; or would at least use them as substitutes, when marl could not be obtained. In addition to these earths, marl may contain ingredients which have not yet been detected by analysis. Some iron, from the colour of it, may be presumed to enter into its composition; and iron, under certain circumstances, may be beneficial to vegetation. As a compound also of broken granites, whinstones, and other rocks, which it certainly is, it may possess properties which those stones acquired by induration. There is, however, more reason to suppose that marl derives its beneficial qualities as a manure, rather from the close mixture of its constituent parts, than from any other cause. No art could intermix particles of clay, sand, and lime in the same manner as they are here found: they are arranged, as it were, particle by particle, and thus their respective powers of action are brought into full bearing against each other. Each particle of lime can exercise its absorbent power to the greatest advantage, or give out its carbonic acid to the small fibre that comes within its reach: the clay is prevented by the sand from being too adhesive; while it retains a moisture advantageous to the growing plants. Clay and sand could not be so scattered but that the first shower would completely separate them; carrying the sand into the ground, and leaving the clay to form a thin stratum over it. Time may effect such a change in the component parts of marl; but it is probable that many years would first elapse; and it is reasonable to suppose that, whenever this has been effected, the land requires a fresh supply.

No substance is found so capable of reviving an exhausted garden as marl. It is in itself a soil; and plants of all kinds, when their roots strike into it, will thrive and flourish. Soil is, in fact, only an assemblage of various earths, and not a particular earth of its own kind. The fertility derived from it may probably depend on the facility it possesses of forming combinations between the various fluids contained in either water or the atmosphere, and its own individual particles, or the manure mixed with them. Thus any alteration in its internal arrangement may become productive of advantage; or any addition to it of a soil of different arrangements; or repeated ploughings, as when a field is fallowed; or rest, by approximating the component parts, when, perhaps by too much action, they may have been thrown too far asunder.

The term *mechanical operation*, which has been applied to marl, may be equally applied to soil; and manure itself may be said in a degree to act mechanically; for though it affords indeed a direct nourishment to plants, it likewise assists in decomposing the elements, like other attracting bodies; and it may, without yielding any direct nourishment, be the means of enabling a root to extract oxygen and the carbonic principle from air and water. The mechanical action of the earths is not to be limited to the mere admission of the roots of plants between their interstices: they may be called barren, but they may have repellent, conducting, and absorbent powers; and, through them, many of the constituent parts of the acids, and the stimulating fluids, (now ascertained to be essential in the economy of the vegetable as well as the animal world) may be compelled to undergo the various changes, and produce the wonderful effects of which they are susceptible.

It may be interesting to enquire what could possibly have been the origin of marl. As it obviously consists of an union of the crumbled remains of many of the primary and secondary strata, we shall be obliged to look back to some great deluge, which must have carried along with it, from distances more or less remote, so many different earths from their original respective beds, mixed them in its course, and then deposited them, while they were in a state of agitation too great for their gradual subsidence according to their distinct and respective gravities. No adequate idea can be formed of the impetuosity of such a flood, for in almost every marl pit an immense number of stones are found, heaped together in the greatest disorder, many of them more than a ton in weight; and all of them worn round, probably by their attrition against each other, as they were rolled along. They are of all kinds, some granite, some sand stone, others whin, and a few lime. From whence could these have been conveyed? No rock of granite, or of whin, is now to be found in Cheshire, or in any of the adjacent hills. That such rocks have existed, their fragments prove beyond all doubt; but they have disappeared. The ground which we now contemplate must be considered as a new creation formed from the wreck of an ancient world, different under every aspect, with hills where we now have valleys, and valleys where we now have hills. How far the devastation extended; whether this formidable revolution was partial, or common to a great portion of the globe, must be left to conjecture. It is probable that it was accompanied by earthquakes, which overthrew the existing masses of solid rock; but no subterraneous heat seems to have acted with sufficient force, to reconsolidate the materials into stone; such as must have occurred during, or subsequent to, the general deluge, of which we have the account in the scriptures.

That this was comparatively a recent revolution is proved by fragments of the secondary strata being found in the marl pits.* Sand or free-stone is evidently a recomposition of former stones reduced to sand. Pebbles of quartz, and other substances, are often found imbedded in it; and its structure shews that it was once a layer or stratum of loose sand, evenly deposited at the bottom of some great water. Whinstone has, in like manner, evident marks of having been a recomposition of materials once existing in a different state. Though opinions have varied respecting the mode by which it acquired solidity, yet from the situations in which it is found; often traversing other strata and filling up the fissures of mountains; superincumbent also, in many instances, over coal and substances of a secondary nature; it cannot be considered as coeval with the granites and other rocks, which are usually believed to have been formed at the beginning of the world. Lime stones, or calcareous aggregates, carry with them the evidence of their induration long after the existence of created beings; some of them consisting altogether of the exuviæ of animals, shells, and bones. We have thus the absolute certainty of two great revolutions of nature having occurred. To the first we must trace the existence of all the whin, lime, and free-stone rocks, with all their neighbouring veins of coal, lead, and copper; and to the second, the strata of rock salt; the extensive and deep morasses, in which have been buried the forests of preceding ages; the several irregular accumulations of marl, clay, gravel, and sand; and all the unindurated earths above which we find neither rocks, nor coal, nor metals of any kind.

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* The remains of animal substances have been found in some marl pits. A few years ago a cow's horn was discovered by Mr. Egerton Leigh in a pit at Withington, seven yards below the surface: and horse muscles have been lately found at a greater depth at Merton, in Eddisbury hundred, by Mr. Manley.

One thing remains to be considered, namely, that if marl is an assemblage of the ruins of ancient rocks, (and we must admit the fact as self proved,) it may have retained qualities fit for the improvement of land, which clay, sand, and lime acquired when they first became indurated. The subjection of any substances to a violent heat alters their nature in a great degree. It is a well known fact, that the vegetation at the base and on the sides of volcanos is exceedingly luxuriant, whenever a sufficient time has been allowed for the thorough decomposition of the lava; and it seems by no means improbable that marl may have derived some of its qualities, from a similar action on its component parts. However this may be, the enquiry is interesting in a philosophical point of view, and is gratifying to curiosity.

APPENDIX. No. II.

A COMPARATIVE VIEW OF THE THEORIES RELATIVE TO THE

ORIGIN OF ROCK SALT.

FEW questions in geological science are so embarrassing and difficult of solution as that which regards the origin of the beds of fossil or rock salt. All the different theories of the earth which have been proposed are eminently deficient in their explanation of these natural phenomena; either contradicting the actual appearances of things, or assigning causes and modes of action totally inconsistent with the established laws of nature. It may not be uninteresting in this place to pursue the enquiry a little further than could with propriety have been done in the body of the Report; not so much, however, with a view of bringing forward any new hypothesis, as of stating and comparing the merits of the most prominent opinions which have already been advanced on the subject.

Of the several geological systems which have engaged the discussion of the scientific world, there are two which have derived a peculiar importance and celebrity, as well from their superior consistency with the appearances of nature, as from the eminence and ability of their respective advocates. These are the Huttonian and Neptunian theories; differing most essentially in their general principles, and in the connection of these polyhedra, which is always mutual, the flat side of one being turned to the flat side of another, and never an angle to an angle, nor an angle to a side. The coats formed as it were round so many different centres of attraction, is also an appearance quite inconsistent with the notion of deposition; both these, however, are compatible with the notion of solidity acquired by the refrigeration of a fluid, where the whole mass is acted on at the same time, and where no solvent remains to be disposed of after the induration of the rest."

The general idea, conveyed by the Huttonian Theory, appears then to be, that the local application of subterraneous heat effected a precipitation of salt from the waters of the sea; that an increased action of heat, directed to the same spot, reduced the saline mass to a state of fusion; that, while fluid, it derived, from the operation of certain unknown forces, its peculiar arrangement and combinations; and that, in the process of cooling, it acquired its present state of induration and solidity. To preserve a consistency with the appearances of nature, it is supposed also that, during the precipitation of the salt, as well as in the intervals between successive precipitations, a deposition of an argillaceous substance was taking place; which, during the subsequent fusion, assumed its present state of admixture with the rock salt.

To this hypothesis, ingenious and plausible as it may appear, several objections may be opposed; affecting at once the validity of its general principles, and their application to the existing appearances of nature. The following are the most important and striking of these objections.

1st. The existence of a central or subterraneous heat has been denied by many philosophers, who rest their argument on two principal grounds; the impossibility of its production or maintenance in conformity with the known laws of caloric; and the certainty that, did it exist, it must diffuse itself over the whole globe, so as to produce every where an equilibrium of temperature. Admitting, however, the existence and occasional operation of such a central heat, there are still several difficulties connected with the supposition of its agency in the formation of the beds of rock salt. It is scarcely conceivable that a degree of heat, capable of throwing off in vapour the whole superincumbent mass of waters, should have been directed to one particular spot on the surface of the globe. It might too with propriety be enquired, what physical cause could so suddenly produce this local determination of the central heat; or, being thus determined, what circumstance could effect so immediate a cessation in its action? The difficulty here is increased by the consideration, that the effect to be accounted for necessarily supposes a repetition of this agency at successive periods, directed to the same spot, and with the same degree of intensity; coincidences too surprizing not to be regarded as improbabilities in any system.

2d. Another powerful objection to this hypothesis, is the circumstance that the earthy salts bear a smaller proportion to the muriate of soda in rock salt, than in sea water. It may be argued, indeed, that the muriate of magnesia is more easily soluble than the muriate of soda; but this does not obviate the objection, as it is evident that the sea water, previously to its conversion into vapour, must have deposited all the salts it held dissolved. It may be remarked at the same time that the sulphate of lime is a salt very difficult of solution.

3d. Had the rock salt been formed in the way which this theory supposed, it is not likely that it would contain its present portion of water of crystallization. A heat, sufficiently intense to drive off the incumbent waters of the sea in a state of vapour, must, in all probability, have carried away at the same time any water which the salt might be disposed to retain in its substance.

4th. If the hypothesis in question were accurate, we might expect to find numerous impressions of marine animals in the beds of rock salt. Should it be said that these remains were destroyed in the subsequent fusion of the saline mass, it may be asked why a similar destruction has not occurred in beds of limestone, which, according to the theory of Dr. Hutton, are also supposed to have been in a state of fusion.*

5th. The idea which this hypothesis conveys of the consolidation of the beds of rock salt is not without its difficulties. Referring more particularly to those now worked in Cheshire, it may be remarked, that as the lower stratum, and the lower parts of that stratum, must have been exposed to a heat of much greater intensity and longer duration, than the upper stratum or superior parts of the lower stratum, we ought to find the salt rock in the former possessing a greater degree of induration and consistence than that in the latter. This, however, observation does not prove to be the case. It might have been expected too, as the heat was sufficient to reduce the portion of the upper stratum nearest the surface to a fluid state, that the bed of clay, interposed between the two strata, would have been much more completely and perfectly indurated than it is actually found to be. These circumstances it is difficult to reconcile with the idea of consolidation produced by the agency of heat.

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* On this subject Mr. Playfair has remarked to me, that the conditions necessary to the preservation of organic remains are involved in an obscurity, which renders all arguments, derived from these appearances, extremely uncertain and indecisive.

Such are the most important objections to the Huttonian theory of the formation of rock salt. It is evident that several of them are not peculiar to this hypothesis, but common to every one which considers this fossil as a deposition from the waters of the sea. It is possible too, that the opinion with regard to the mode of deposition may be so modified as to remove partially, or entirely, some of the other difficulties which have been stated; as there are certainly several circumstances connected with the natural history of rock salt, which render it sufficiently probable that heat has been an important agent in the formation of this mineral. Great scope for ingenuity and observation is still left in the prosecution of the enquiry.

The Neptunian hypothesis on this subject differs in many essential particulars from the one just stated; rejecting altogether the operation of heat, and referring the present state and arrangement of the beds of rock salt, as well as their original formation, to the effects of aqueous deposition alone. In none of the writings, however, of those who have espoused this doctrine, do we find a precise or detailed account of the particular mode of formation assigned to the fossil in question. Without any reference to the disintegration of more ancient rocks, they seem to consider it simply as one of the latest precipitations from the fluid menstruum, which originally held all the materials of the strata in solution. No supposition is offered as to the immediate cause of this deposition of salt; but it is stated, in general terms, as depending upon some mode of chemical agency; or, as constituting one in that series of changes, which may be supposed to have taken place, where so many powerful chemical agents were brought together in a state fitted for their mutual operation. In illustration of some of the modifications which the idea of the aqueous formation of rock salt may receive, I have made the following extract from a very ingenious work, published in Edinburgh, some years ago, in reply to Professor Playfair's Illustrations of the Huttonian Theory.

"It may be difficult, even on the Neptunian Theory, to give a satisfactory explanation of the origin of rock salt; but there are no appearances in this fossil inconsistent with the supposition of its aqueous origin. The Neptunists have supposed that it may have been formed by collections of the original sea water in hollows, among the strata, having suffered evaporation during the temporary retreat of the ocean, and that these, having been successively filled, have furnished the strata of rock salt. But it is a strong objection to this, and all other theories which derive it from the evaporation of sea water, that it does not contain the saline substances which are dissolved in that water; or at least does not contain them in the due proportion; and that it contains fewer remains of marine animals than we should expect, had it had such an origin. Perhaps we may suppose, that the saline substances, in common with others, had existed in the original fluid in which all the strata were dissolved; that part of these being locally accumulated, in the same manner as the materials of every other stratum have more or less been, from circumstances which we cannot determine, had been confusedly crystallized; and that any remaining portion had been retained in solution by the water, those salts of course remaining in it, in increased proportion, which were least disposed to crystallize. Such is the muriate of magnesia; and it is no impossible but that even much of the muriate of soda now found in sea water, may have been redissolved from strata formed; or we may modify this explanation by the equally probable supposition, that at first the soda and muriatic acid of the salt had not been in combination; but that, in the course of the various alterations of attractions from the precipitation of the strata, they had been brought together, had united, and, if locally accumulated, crystallized. Such a supposition receives confirmation from the fact that, in many of the strata, in trap, for example, according to the excellent experiments of Dr. Kennedy, both soda and muriatic acid exist, and sea salt itself is sometimes found among primary strata. This general hypothesis, modified in either of these ways, involves no improbable suppositions, and is perhaps adequate to the explanation of the production of this fossil."

The vague and indefinite manner in which these statements are conveyed, indicates at once the extreme obscurity of the subject, and the difficulty of explaining it consistently with any general scheme of geology. It is obvious, indeed, that the theory which ascribes the formation of rock salt to the agency of water alone, labours under many embarrassments and inconsistencies; some of which it is scarcely possible that any modifications should entirely remove. The most important of these objections to the hypothesis it may be proper to state.

1st. It is difficult to conceive that any chemical agency should induce so copious a precipitation of the muriate salt is considered as appertaining to the third or floetz formation; a class of rocks which comprehends varieties of sandstone, limestone, gypsum, trap, &c. and from the abundance and variety of the petrefactions which it contains, is supposed to have been formed at a time when organized beings were numerous upon the surface of the globe. The immediate position of the rock salt, according to this arrangement, is with the first floetz gypsum; a formation, which is placed directly above the first floetz limestone, and is remarkable, as well as the second floetz gypsum, for being totally destitute of petrefactions or organic remains.* This circumstance it is difficult to reconcile with the supposition of aqueous origin; nor does it appear probable that any modifications of the Neptunian Theory would entirely rescue this idea of the formation of rock salt from the difficulties which have been stated above.

Such

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* The fibrous and lamellated species of rock salt are considered as having the same geognostic relations. In the Cheshire mines, the fibrous rock salt is usually found in the veins which perforate the strata of indurated clay.

M. Brochant, a disciple of the Wernerian school, in his "Traité Elémentaire de Mineralogie," gives the following general account of the mineralogical relations of rock salt, which may be regarded upon the whole as extremely accurate. "Le sel gemme forme quelquefois une espèce particulière de montagnes stratiformes, dans lesquelles ses couches alternent le plus ordinairement avec des couches d'argile, toujours plus ou moins pénétrées de sel; très souvent aussi il est mélangé avec du gypse, de la pierre puante, de la poix minérale, du grès, etc. Le gypse surtout a des rapports géologiques très-marqués avec le sel gemme, et il est très rare qu'il ne se trouve pas dans son voisinage. Le plus souvent néanmoins il ne se trouve qu'en petites couches subordonnées ou en masses isolées, dans les montagnes dont la masse principale est le gypse, la pierre calcaire, ou l'argile. On en a trouvé aussi en filons, mais on en cite peu d'exemples."

I am

Such is a very general sketch of the two most important opinions which have hitherto been advanced relative to the formation of rock salt. It will be seen that each of them is liable to a variety of objections; arising partly from the uncertainty of the general principles which they assume; partly from a defect in the application of these principles to the existing appearances of nature. Some of the difficulties connected with the subject, as they are common to these, and to every other hypothesis of a similar nature, may perhaps be dismissed entirely from the calculation; there still remain numerous points of comparison between the two theories, in which the probabilities of the explanations they respectively give of the phenomena in question, may be weighed and ascertained. It is by no means the object of this paper, either to pronounce a decided opinion upon their comparative merits, or to propose any new hypothesis which may elude the several difficulties already stated. Although, however, at present, it appears impossible to afford an explanation which shall preserve a perfect consistency in all its parts, we are certainly entitled to expect that, at some future period, the advanced state of general science will throw new lights upon the subject, and enable us to prosecute, with renovated spirit and success, an enquiry which must ever interest and gratify the student of nature.—*H. H.*

I am not aware that I can plead a more satisfactory apology for the detailed account I have given of the natural history of the Cheshire salt mines, than the circumstance that M. Brochant, in his statement of the principal mines of this description with which we are acquainted, makes not the slightest allusion to them; though in extent and commercial importance they undoubtedly exceed any other in the world.

APPENDIX. No. III.

ON THE USE OF SEA MUD AS A MANURE.

SINCE the report was drawn up, some additional and very interesting remarks, on the use of sea mud as a manure, have been communicated to me. They are contained in a letter from Mr. Orred of Higher Runcorn, who says, " After experiencing, for fifty years, the advantage of the use of sea-sludge as a manure, I can positively assert, that no other is equal to it, either for corn or grass. We have what we call the *green sod sludge*, and the *slob:* the former is the strongest, and is consequently always preferred when it is to be had. We generally get four rood to the (Cheshire) acre. I have frequently carried it near a mile, when I had good marl on the spot; as it is got with so much less expense, and answers so much better. We take one graft off the lower part of the marsh, never going deeper. One man gets it with the shovel, whilst another puts it into the cart with a pitch fork. We always lay it upon grass, and plough it in the spring following. If the ensuing March is dry, and there has been much frost in the winter, a heavy pair of harrows will prepare it for the plough; otherwise it must be chopped with spades; but this is seldom necessary. We always sow the land with oats the first year, and have generally 140 bushels to the acre, I mean the Cheshire acre, eight yards to the perch. After oats, we either sow barley, or plant potatoes. If barley, we have, on an average, 100 bushels per acre: I have had 160. If planted with potatoes, we have seldom less than 400 bushels per acre, 90lb. to the bushel. The third year, we have always as much wheat as can grow upon the land. The fourth year, the land is laid down, either with oats and clover, or barley and clover. We always mow the clover once, and have as much as can possibly be cut out: it is then kept in pasturage four or five years, and though I have been in most counties in England, I never saw richer or better. If a field is over marled, it is spoiled for grass; but this is never the case when the sea mud is used, and the latter remains much longer in the land. I make no doubt but there are many situations in England, where the sea mud might be made as profitable as it is here, were the proprietors of land apprized of its advantages."

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ERRATA.

Page 93, line 15, for *propositions* read *proposition*,
96, — 8, for *in* read *of*.
96, — 10, for *effects* read *effect*.
98, — 1, dele *as well*.
98, — 9, for *enlargements* read *enlargement*.
197, — 21, for *chapter* read *section*.

N. B. The reader will observe that there is an occasional variation in the spelling of the word *Namptwich*. In the list of parishes with which I was favoured by W. Nicholls, Esq. it is spelt Nantwich: this mode, however, is at present much less frequent than the former, and its occasional occurrence in the work must be attributed to accident alone.

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Canary.
Chicory.
Clover. Common red.
—— Perennial, or cow-grass.
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Clover. Malta.
—— Providential.

Flax, or linseed.
Furze.

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—— Poland.
—— Potatoe.
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—— Caspian.
—— Black.

Parsley. Plain.
Parsnip. Large thick.
Pea. Marlborough grey.
—— Large grey rounceval.
—— Early white.
—— White boiling.
—— Pearl.
—— Blue Prussian.
—— Maple.
Potatoes. Ox-noble.
—— Late champion.
—— Large red.
—— Nicholson seedling.
—— Bomb-shell.

Rib-grass. Lambs-tongue, or
Upright plantain.
Rape, or colseed.
Rye.

Sainfoin.
Saridella.

Tares. Spring.
—— Winter.
—— White.
—— Perennial.
Trefoil. Birdsfoot.
—— Common, various sorts.
Turnip. Early Stone.
—— White Norfolk.
—— Norfolk bell.
—— Stubble.
—— Green top.

Turnip. Red top.
—— Large yellow.
—— Globe.
—— White tankard.
—— Green ditto.
—— Red top ditto.
—— Large Dutch.
—— True yellow Swedish,
or ruta baga.
—— White Swedish.

Vetch. Kidney.
—— Chickling.
—— Pale-flowered.
—— Everlasting.
—— Great wood.
—— Six-flowered.
—— Tufted.
—— Bush.
—— Hoary.
—— Sainfoin.
—— Red-flowered.
—— Biennial.
—— Bastard.
—— Broad-podded.
—— Rough.
—— Single-flowered.
—— Narbonne.
—— Flat-podded.
—— Hairy ditto.
—— Narrow-leaved.
—— Streaked.
—— White-flowered.
—— White-seeded.
—— Horse-shoe.
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—— Liquorice.

Weld.
Wheat. Red Lammas.
—— Common white.
—— White hedge.
—— White Siberian.
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